SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

VENTILATION OF MINES.

Sir,—The great advantages claimed for the Guibal Fan may, perhaps, be summed up in a short space. The action of the Fan is on the surface, and, consequently, the engines and all the appliances are there, so that the heated air-shaft is entirely dispensed with. There is, therefore, no danger of underground fires from the furnace, neither explosion of gas, ignition of coal, or other strata, &c. And, as the upcast shaft is cool, and nearly at a uniform temperature throughout the year, all injury to the tubbing, framing, &c., in the shaft is entirely avoided, and, if desired, the upcast shaft can be used as a drawing shaft with the same facility as the downcast shaft. Again, the Fan performs a certain amount of work—that is, extracts a certain quantity of air at each revolution, and the number of revolutions are known with the greatest accuracy, so that the actual quantity of air in circulation through the mine is known absolutely for any given time, either for a day, a week, or any other given period. And the quantity of air can also be largely increased in cases of emergency by running the Fan at increased speed. Thus the Usworth Fan, running at 40 revolutions per minute, puts into circulation about 160,000 cubic feet per minute, and when run up to 50 revolutions and upwards, which is quite practicable, of course the quantity circulated is largely increased.

Now, if we look on the furnace as a whole, it is without doubt in many respects a rude and barbarous mode of ventilation when compared with the ventilating fan. We have the great danger of underground fires, the intolerable heat in the upcast-shaft, and consequent injury to everything in it, and great difficulty and expense in all necessary repairs to the same. It is also rather difficult to get anything like a uniform rate of working out of a furnace. The accounts we obtain of furnace ventilation are always the maximum amount of air got and measured when all the men at the furnace are fully on the alert, and there is considerable danger of a great falling off in their quantities in certain hours of the day, and more especially during the night. It is well-known that it is quite possible that a furnaceman may drop asleep at his post far removed, in some cases a mile distant underground, from the working places.

July 10. VIEWER.

MINE OWNERS, AND THEIR LESSEES—No. II.

Sir,—The view of this question taken in my letter, published in the Supplement to last week's Journal, was from the stand-point of the political economist; the realisation of such a state of things as there suggested is so far distant from the present that it is not of any utility to dwell longer upon that aspect of the subject. Sufficient for the day is the evil thereof. Let us suppose that the owners' rights and powers over the minerals contained in their estates to remain for some hundreds of years to come as they now are. The more liberally disposed will have their mines developed more quickly than those who hold out until their neighbours have done all the work for them in the way of proving. The same ungenerous spirit which inclines them to make a cat's-paw of their neighbours will also prevent the owners from accepting a reasonable royalty when it is known the coal is beneath their properties. Now, when we think what the realisation, or conversion into capital, of minerals in an estate really signifies, it will be seen that waiting for a better royalty or better terms generally must be a losing game, unless there be some other reasons for not working the minerals, such as defacing a residential property, or what not.

Fifteen years is not a long time to keep a property undeveloped in the way I have supposed, and yet money invested at 5 per cent. compound interest doubles itself within that time. It is one of the first enquiries of the purchasers of mineral property how long will it take to bring the minerals into the market and convert them into money? If long he requires the price to be low, or time over which to spread the payments. This consideration respecting interest is one affecting the sellers of mines as much as the purchaser. The eagerness of every lessee of mines to get and convert into money the products of the mine is to the landlord a pretty good guarantee that they will be worked with vigour, without fixing a very high minimum royalty. It is well to have some minimum rent, but I think the principle of estimating the amount by the total area of mines in lease is to some extent erroneous, and especially where the power to underlet is withheld. One may rent on lease 1000 acres, but you cannot bring such an area into play or productiveness at the same moment, and yet it is commonly the case to fix the minimum at a rate per acre over the total area in lease. No deep mines will be opened unless a large area is secured to work at, in consequence of the great outlay which is necessary in opening up deep mines.

No deep mines can be won and driven out without an enormous expenditure of capital, hence the landlord has a sufficient guarantee that the mines if workable will be wrought with energy without fixing any enormous minimum rents. Thus, I presume if the Huntington colliery scheme, near Cannock, had been carried out the first outlay of 16,000*l.* to 20,000*l.* would have been but a small portion of the capital to be embarked in the colliery before it would have been in a position to fill truck and boats at the rate usually produced by collieries of such proportions. What with rolling stock, locomotives, construction of railway, permanent winding and pumping-engines, sinking a second shaft, and making other permanent plant in lieu of what has been previously put up for the sinking only, and more especially in heading out the shafts, at least another 20,000*l.* would be required. Suppose the capital expended to be 40,000*l.*, then we have at 5 per cent. a sum of 2000*l.* a year in interest standing to be lost unless the works are carried on with energy.

In the face of this do we suppose there would much dawdling? The colliery would not be likely to stand without some serious and very sufficient reason. Indeed, a colliery of such proportions cannot be alternately worked and put to stand at the caprice of the lessee. Re-opening a colliery is by far too serious a matter to allow of such a method of working. It seems to me that in all large collieries a minimum amounting to as much as a surface rent in agricultural districts would be fair, and insure an income from the mine without abstracting money from the other resources of the lessee. But a tenant for life will not agree to this, his object being to get the greatest possible sum out of the estate during his enjoyment of it. If the mine is profitable there cannot be much doubt about the lessee working it as rapidly as possible, if it be not profitable the landlord scarcely acts honestly in enforcing the payment of a heavy minimum rent. It serves the lessee right if he enters into covenants by which he is bound at all to an unprofitable colliery if taken on royalty. It also serves him right if he accepts to pay too heavy a minimum; the lessees must take care of themselves.

It is not of serious consequence to the nation now whether owners and intending lessees can agree together or not, seeing that from one or other of our numerous coal fields we have about 1000 years get of workable coal; it is, however, a serious matter for some exhausted districts, like South Staffordshire, for instance, because it simply means closing them. The landlords may say—"If coal is so badly wanted they can have mine by paying me well for it." Or, "Is it not fair that I should avail myself of the position in which the coal and ironmasters of that district are placed?" "Now is my time to make good terms." This would be a grand mistake, for it would simply have the effect of sending the iron and coal trades to other districts, so that the mine owners will be placed in a worse position for letting every year if they force on this condition of things, for they will awake to the fact that the staple trade is gone, and the mines are not wanted. Empty houses, extinguished furnaces, mills and forges standing and unsaleable, ironworks pulled down and broken up to re-melt, complaining ironmasters and petty tradespeople, the filling up of order-books only after other districts have been supplied, these are signs of the times in such districts.

I would remind the reader that as the process by which an important staple trade passes from one district into another is gradual, much more gradual would be its return to our district if once lost to us; and very slowly would the mineral wealth which we hope to find beneath the New Red Sandstone be developed after the population of colliers and miners, and the capital of the ironmasters, had left the adjacent coal districts. If ever there was a time when the question should be settled, whether the district between the Shropshire and Staffordshire coal fields is truly filled with mineral wealth or not, it is at this moment, when we find our old ironmaking districts failing, and becoming deserted both by masters and men. What avails it that we should delay such proof some 20 or 50 years, till no manufacturer remains to consume the products we might have to offer? We all know that the iron trade has moved from the South, where, in the county of Sussex, it once flourished. It settled in Shropshire, and eventually in the neighbouring county of South Staffordshire, and in South Wales. The discovery of the cheaply worked oolitic ores has caused great changes in South Staffordshire, but it is the failure of fuel which has to be feared. In 1867 Mr. Baker refers to this in his report:—"Of the 544 collieries referred to in my last report there have been about 300 in operation in the course of the year under review, from which, according to the returns kindly and confidentially sent me by the coal trade, 10,268,000 tons of 2240 lbs. have been raised (including the colliers' allowance coal, colliery consumption, waste, &c., which is estimated at about 1,300,000 tons)." He considers that such an output will in a few years exhaust the supply for the purposes of iron manufacture. It was only in 1813 that Coalbrookdale was spoken of as "the centre of the most extensive ironworks in the kingdom." In 1835 another writer remarks:—

"It is certain, however, that of late years the collieries have been so industriously and generally worked that almost all the best seams, both of coal and iron-stone, to the west of the Lightmoor fault, and south of Kotley, are nearly exhausted. To the south of the Severn, in the vicinity of Broseley, there are eight or nine furnaces, but they are now all blown out, for want principally of the proper description of fuel. A valuable supply of coal and ironstone, however, yet remains in the districts east of the Lightmoor fault, and at Donington Wood. Still, from the limited extent of the coal field as now known, and from the great activity with which it is worked, it appears probable that the minerals for the manufacture of iron will be exhausted in a few generations. The ironmasters must then continue their works under the New Red Sandstone, beneath which it is to be hoped they will find, though at great depth, a new and abundant supply."

That was written in 1835; the succeeding 35 years, as may be supposed, has contributed to the exhaustion of a large portion of what remained. We have, as admitted in both districts, arrived at that point when the workings must be carried under the New Red Sandstone. That has to be done, or shortly those districts will have to be closed. Let us hope that the next scheme brought forward for this purpose may not be encumbered with the objections to which your Journal has recently pointed. It is a matter much in the hands of mining engineers themselves, for they are called in to advise proprietors, and I think they ought first to bear the blame rather than the landlords. D. S.

PERSEVERANCE AND SUCCESS IN MINING ADVENTURES.

Sir,—Most people who have had much experience in mining will, I think, heartily agree with the opinions of Mr. Tredinnick, in his letter which appeared in the Supplement to last week's Journal, relating to the vigorous re-working of old mines. Too many of us know what a wearisome, hope-deferring, and oft times hope-blasting an undertaking the opening of a new mine is; how, in many, such undertakings both capital and patience are exhausted, and the work is abandoned by the original promoters, and the loss of their sunk capital moodily acquiesced in. Then the mine passes into other hands, and then frequently it proves a signal success. The first company has accomplished the principal part of the dead work, to their utter loss and disappointment; the second have reaped the advantage of this, have commenced their work at the point where the others ended, and have pushed it on that little bit further, which the former hands, through disgust and disappointment, failed to do, but which little bit crowned the whole with success. It would be easy to name half-a-dozen new mines, some of which a short time ago were in high favour, and at great premiums, which are now rapidly approaching the first stage above described, and may, perhaps, in no long time arrive at the second. As a rule, then, I think it will be allowed that there is a better prospect of a successful issue in taking up a mine that has already been opened out to a considerable extent, than in opening a new mine, which has not been worked at all.

But the prospects of success are better still in re-opening old mines, under such circumstances as those alluded to by Mr. Tredinnick—mines which in past times have been worked profitably, but which have been abandoned through want of energy or enterprise in those who had the management of them. There is many a mine, in Cornwall especially, which was once being worked profitably, but the working of which was given up, through want of machinery sufficiciently powerful to keep down the water and raise the ore. Many such instances will, doubtless, occur to the minds of those conversant with Cornish mining. One such instance I have lately seen described —the Old Treburgett Mine. This seems to have been profitably worked almost from the first opening of it, and was being worked with profit to the last, and was then abandoned only through the influx of water overpowering the capabilities of the engine they then had in use. As this mine was carried down by the old workers only to 50 or 60 fms., there is, we may reasonably presume, a rich harvest of success in prospect for those who have lately undertaken the re-opening of it with powerful machinery. This occurs to me as one instance of re-opening old mines where signal success may be reasonably looked for; and, doubtless, many such opportunities will readily present themselves to those who are well acquainted with Cornish mines and mining. In such cases, after the unwatering and restoring works, which time and the natural process of decay have destroyed, there is scarcely that "little bit" further of dead work to be accomplished, but the men of greater enterprise and more powerful appliances may almost calculate upon their entering at once upon a field of profitable labour. Vetus est Melior.

THE MINERS' ASSOCIATION—FOUR GOOD EXAMPLES.

Sir,—To the "Three Good Examples" mentioned in last week's Journal will you add another? Lord Portman, as Warden of the Stannaries, has contributed 10*l.* to the funds of the Miners' Association of Cornwall.—*July* 12. Robert Hunt, Hon. Gen. Sec.

THE INFLUENCE OF CROSS-COURSES, CAUNTER LODES, OR FAULTS ON METALLIFEROUS VEINS.

Sir,—As some of your readers, like myself, may not be practical miners, but only neophytes seeking for mineralogical or geological knowledge, it may not be uninteresting to those if I briefly open up a discussion upon the title of this article by endeavouring practically to explain, by the aid of the longitudinal section of the Old Treburgett Mine, what is meant by the expression so frequently met with in mining reports:—"That the mining sett being traversed by cross-courses was an additional important element in the future success of the mineral ground to be explored." The section of the Old Treburgett Mine that appeared in last week's Journal not only aptly illustrates this phase that where cross-courses intersect a lode large deposits of mineral will be found, but also shows what frequently happens—that the mineral-bearing lode, in consequence of such intersections, is sometimes dislocated, thrown out of its straight course, and lost. The characteristics of cross-courses, caunter lodes, or faults is that although they seldom contain any mineral themselves, yet they exercise a productive effect upon the lodes they cross, intersect, or come in contact with; they are either composed of a soft clayey substance, called flookan, or of a quartzose nature. The miner prefers the former, as it prevents the water from the surrounding country percolating through, whereas the latter frequently upon being driven into seriously affects the working of the mine by the flood of water it discharges when intersected.

Another characteristic of these non-metalliferous veins is the expense, vexation, and disappointment they sometimes cause the miner by cutting off his lode as with a knife, and heaving it either to the right or left, sometimes only a few feet, whilst at others it is carried away a considerable distance, and in many cases entirely lost.

This is the case in the above-mentioned mine. The mineral-bearing lode has been cut off at each end by a cross-course, and has not yet been found on the other side, although many thousands of pounds have been spent years back looking for it. In the 20 north it will be seen that so soon as the old workers reached the cross-course they lost the lode; they, however, continued the level a long distance, but not finding the lode left the end of the level driven in the country. A cross-cut to the lode has since intersected a small lode, but it is considered to be only a branch, the main lode being still ahead; if not, it merged into, and went off with, the cross-course to the right hand.

A similar occurrence happened at the other end of the mine south. Here in looking for the lost lode the quartzose cross-course was intersected, and a torrent of water rushed out (now being dammed back again), and overpowered the small engine then at work, and led to the cessation of working. The dislocation or heave of the lode by these cross-courses is of great interest, not only in a geological point of view, but also financially, as it is expected when the lost lode is really found it will amply repay the expenses of looking for it. The immediate object of the present company, however, is to get down to the bottom of the old workings and open up the mine in depth, so renewing the workings to their former productiveness. Few, if any, mines ever produced so great a quantity of solid ore from such limited workings as the Old Treburgett. The lead ore then only sold for 8*l.* a ton, but it now fetches three times that amount, with the addition of a true silver ore (polytelite) found in the wall of the lode. This silver is the same as that found in the silver mines at Frieberg, from whence the Kings of Saxony have derived so much wealth. In the 40 the workings are 10 to 12 ft. wide, showing the wealth of the lode. As it is an established fact that the present paying mines are those which have been reworked, great expectations are entertained by all interested in the development of this property in depth.

The Temple, July 13. T. A. Masey.

MINE AGENTS, AND THEIR DETRACTORS.

Sir,—Within the past few days I have been favoured with a book composed, or rather compiled, by a Devonshire merchant on the direction and management of the Devon Great Consols, copies of which have, I understand, been sown broadcast over the counties of Devon and Cornwall, and elsewhere throughout the country. At first sight, as the contents of this book appeared to be confined wholly to the affairs of the mines referred to, I was at a loss to imagine what motive the author could possibly have in view in forwarding an effusion of this description to anyone outside the pale of the company. On a little closer examination, however, I discovered the following complimentary remark, which at once solved the enigma. The author writes:—"As to the paragraph which refers to an improvement in one of the lodes, no mining report would be complete without it—keenly indications and future expectations are the soul of mining," &c. Now, it will be observed that, although this is intended in one sense to apply to the annual report of Capt. Richards, the manager of the Devon Great Consols (whose reports it should, especially at this moment, be remembered have, according to public records, been verified by the return of 550,000 tons of ore, realising upwards of 3,000,000*l.*), it clearly is meant to embrace the reports of mine agents generally, and that being the case, I avail myself of the present op-

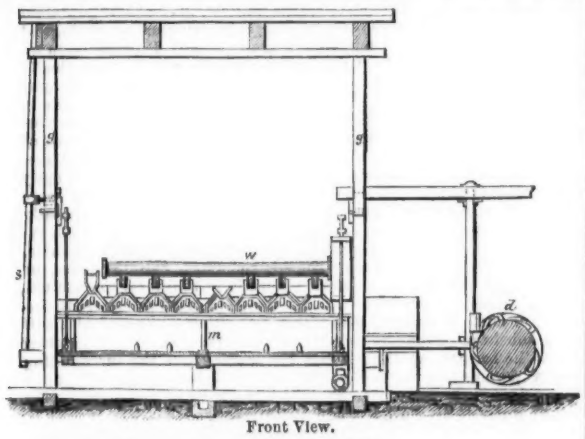
portunity of thanking the author of this book (who, it is tolerably certain, except in one solitary instance, has scarcely ever embarked 1s. in mining in his lifetime), for his gentlemanly allusion to a class of persons whose favours he has, singularly enough, for years past, with some degree of pertinacity, been in the habit of soliciting; and as this allusion is quite in accordance with the tone of the remainder of the volume, I would at the same time echo the general sentiment of approval in reference to the course which has been adopted by the directors of the Devon Great Consols in treating this production, *in toto*, as it deserves—with dignified silence.

During my experience I have always found that more injury has been caused to legitimate mining by the interference of captious merchants and local committees than from all other sources whatsoever. Unhappily it is by no means rare to find that honourable and straightforward supporters of real legitimate mining, who have stood the brunt and heat of the day, have to stand or sink to make way for the unscrupulous advance of self-applauding mediocrity and assurance.—*July* 11. A MINE AGENT.

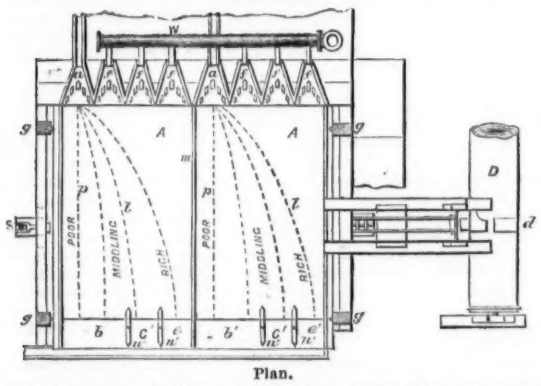
ORE DRESSING—No. X.

SIR,—The second class of intermittent acting concentrators are known as Stossheerds or Shaking Tables. Up till lately jigs had only been used for concentrating coarse-grained ores, the sands and slimes being always treated by these shaking tables, or buddles, or other similar concentrators. At present the ordinary kinds of shaking-tables are almost things of the past, they having been supplanted in most dressing-floors by the sand-jigs; they can, however, still be used with advantage where labour is cheap, and where the ores are easily separated. These machines consist of a table, or platform, about 8 ft. long and 3 to 4 ft. wide, suspended by chains at the four corners, the front end being lower than the back. The inclination of these tables varies, according to the size of stuff to be treated, from 3° to 8°. The long sides are furnished with strips about 8 in. high, which serve to keep the ore and stuff from falling over. The motion is given by a cam shaft, revolving at the head of the table, the stroke being in the direction of the flow of ore. The return stroke, or shock is caused by the weight of the table. The speed varies from 60 to 100 strokes per minute, according to the size of the stuff. The action of this apparatus was as follows:—The ore being previously mixed thoroughly with water, is made to flow in an equally distributed stream over the table. The heaviest grains settle down almost at once, while the lighter particles are carried further and further by the current of water, aided by the shocks of the cam shaft. As soon as the bed on the table attained a thickness of about 6 or 7 in. the machine was stopped, and the ores dug out, according to their different grades. The chief objection to these tables is the fact that they require so much manual labour, first in maintaining an equal bed while the machine is in motion, and, secondly, in digging out the bed each time the charge was full. Then, as they generally depended on their own weight for the recoil, they were necessarily constructed very heavy, and required a large amount of power to keep them going, and from the fact of their having to be stopped for nearly two hours after each charge, to allow of the digging out, the amount of work performed was necessarily small.

A very great improvement on these machines is the continuous working stossheerd of Prof. Rittinger. The general construction of these tables is very similar to the old ones, only that the shock is a lateral one, at right angles to the flow of the ore; also it is necessary that the surface of the table should be perfectly smooth. The accompanying sketch will show the construction of this machine.



Front View.



Plan.

A, *A* is a table, or platform, about 2·50 m. square, with a central division, *m*, running from top to bottom, and forming, therefore, two distinct concentrators. This platform is suspended to the posts *g*, *g*, *g*, *g* by chains, with an inclination towards the front of from 6° to 8°. The lateral throw is imparted to the whole table by means of the cams, *d*, on the shaft, *D*, the return stroke, or shock, being by means of the wooden spring, *s*, on the opposite side of the machine. The stuff to be concentrated is fed through the troughs, *a*, *a*, on to the left hand corner of each table, or compartment; an equal flow of fresh water is then turned on through the pipes and distributers, *f*, *f*, *f*, *f*. As long as the machine is at rest the tendency of the stuff and water would be to flow straight down the incline in the direction of the dotted line, *p*, but immediately the machine is put in motion the lateral percussion forces the particles of ore to take a direction from left to right. This advance in that direction, however, is impeded, more of less according to their weight, by the flow of water from the distributors, *f*, *f*, *f*, *f*, which carry down at first the lighter portions, and eventually also the richest and heaviest, which last have then taken a course shown by the parabolic line, *l*. The middling rich ores have in the meantime followed the direction of the other dotted lines. These lines, of course, are apt to vary considerably, according to the speed at which the shaft, *D*, revolves, and also according to the coarseness or fineness of the stuff treated, and, therefore, the partition slips, *n*, *n*, are made movable on a central pivot. The different grades of ores are then collected in boxes, or tanks, below. The machine generally gives three products—the produce which falls over the edge in the compartment *b*, *b*, which is either considered as waste or can be treated again; the produce of *c*, *c*, which is a low grade of ore; and the produce of *c*, *c*, which is finished ore. In order that these machines should give a good result, it is necessary that the following points should be attended to:

1.—The speed of the shaft, *D*, should be perfectly regular, as the slightest irregularity in this point at once changes the direction of the stuff, and prevents a separation. In places where the motive-power is employed for other purposes, such as crushing, which might cause irregularity of speed, it is advisable to furnish the cam shaft with a heavy fly-wheel. The speed at which these machines should work varies according to the size of the stuff treated. For coarse sand 75 to 80 strokes a minute will suffice, while for very fine slimes 150 to 160 strokes per minute will not be found excessive. The length of stroke for sand should be about 0·06 m.; and for slimes it should vary between 0·12 m. and 0·025 m., according to the amount of fineness.

2.—The surface of the table should be very even and smooth, and perfectly level in the direction of the stroke. The tables have been made of various substances, such as marble, cast-iron, and even glass. Those most generally in use are made of marble, as being cheapest. Where this article cannot be obtained a surface of cast-iron planed has been found to succeed very well, though care must be taken to keep the surface always covered with water, otherwise it becomes rusted and uneven. Thick glass forms also a very good bed, but is apt after long use to become starred over the whole surface.

3.—The stuff to be treated must be thoroughly disintegrated in water before being admitted, and the feed must be perfectly regular and uniform. The base of the ore distributers should not be broader than one-fifth the breadth of the tables, and should not be less than one-eighth of the same; the general width is about 0·25 m. Sands of about 0·005 m. can be well concentrated by this machine, but the most perfect concentration is obtained with very fine slimes. The amount of ore put through one of these machines is about 6 or 7 tons per day of 10 hours, and one boy can attend to two double tables. The amount of water required is from 1 to 1½ gallons per minute, according to the size of the stuff. This water is, of course, independent of that with which the ore is previously mixed. As a general rule, the stream of water spread over the whole surface should not be strong enough to carry away any of the stuff while the machine is at rest. The force required to work these machines is very slight, half of one horse power being snfficient for fifteen twin tables.

New York, June 18. E. G. SPILSBURY.

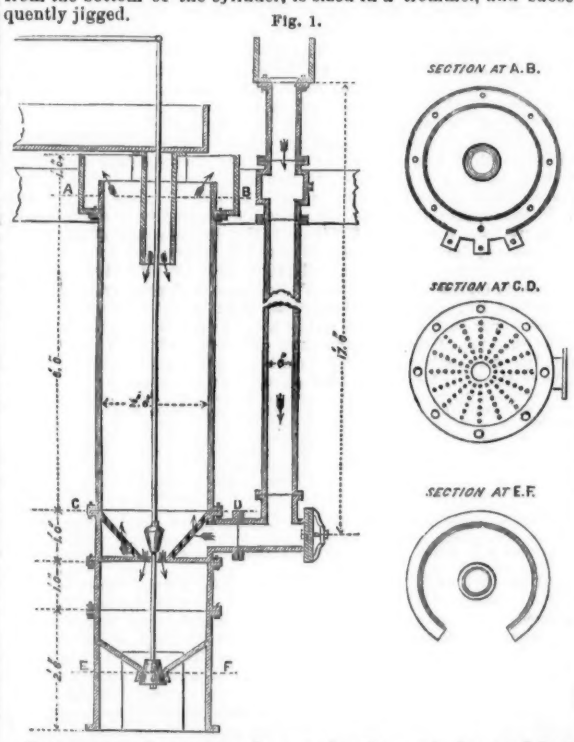
FIRING BLASTS BY ELECTRICITY.

SIR,—I perceive from the *Mining Journal* of July 8 that "Fron" is desirous of information as to the firing of blasts by electricity. Permit me to say that in the general line of operations, to use a Yorkshire phrase—"It's up to nowt." If one advantage could be claimed for it, there are five against it. The cost and the time in adjusting the electric wires to four, six, or to eight charges at a time of ever-varying distance in depth as the work proceeds, and the breaking and utter derangement of the wires after the blasts in an already encumbered state, with no compensating feature of safety to life or diminution of labour about it in case of gas, bad ventilation, or falling water.—*Bolton, July* 10. C. B. (A Sinker).

ON THE DRESSING OF ORES—No. X.

SEPARATING CYLINDER.—Fig. 1 represents a washing and separating apparatus in use at one of the Commern lead mines, near Düren. The cylinder is 30 in. in diameter, and 11 ft. 6 in. long. This cylinder is provided with an admission launder and pipe, a pressure column, plug-valves, outlet opening, and escape launder. Sand and water flow through the central pipe against an ascending column of water delivered by the pressure-pipe. Light sand passes over the top of the large cylinder, and heavy grains into the chamber between the two plug-valves, the grains being from time to time discharged through the rectangular-shaped portway, by opening the bottom valve; the quantity of sand and water which flow into this apparatus is 40 cubic feet per minute. This volume of sand and water is diluted with 8 cubic feet of clear water, delivered by the pressure column. The stuff submitted to the separating cylinder at the Commern Mines consists of quartz, associated with grains of galena, varying in their dimensions from 0 to 2 millimetres. The sand and small-grained ore which flow over the top go to a large classifier, and from thence to buddles. The rough sand, 1 to 2 millimetres in diameter, derived from the bottom of the cylinder, is sized in a trommel, and subsequently jigged.

Fig. 1.



CLASSIFYING LAUNDER.—In some dressing-works fine sand from the top of slime peters, separating cylinders, and fine-grain sizing trommels, flow into an expanding launder, in which the particles possessing equal velocities of fall are collected. The total length of the classifying launders shown in Fg. 2 is 28 ft. 4 in. The trough, including the first four divisions, 10, 13, 17, and 22 in. wide respectively, is 3 ft. deep and 6 ft. 8 in. broad at the top, with one side set at an angle of 45°, the other at 60°. The second, connected with the first trough, contains five divisions, each 29, 39, 52, 67½, and 88½ in. wide, 7 ft. 7 in. broad, and 4 feet deep. The stream expanding launder at the entrance of the slime water is 10 in. wide, and 4 in. deep. From this point to the further or effluent end the width is gradually increased to 36 in., and the depth from 5 to 18 in. Along the bottom is a continuous opening, ¼ in. wide. The water-launder, outside of the steam-launder, is 40 in. wide and 6 in. deep, and is pierced with plug-holes, each 1 in. in diameter.

The gradual widening of this launder occasions a corresponding decrease in the velocity of the stream, and a deposition of the grains in the several hutches, according to their respective equivalents. This necessary result is assisted, and subject to modification, by allowing more or less clear water to pass through the plug-holes. The distance between each plug-hole in the water launder is progressively greater as the stream launder widens. This feature is one of some moment, inasmuch as the volume of water is thereby lessened with the decrease that occurs in the equivalent value of the grains. The water launder delivers to the apparatus from 150 to 200 gallons per minute. At Altglück, the troughs and launders are made of beech plank 2 in. thick. The first four sand hutches are emptied once a day, the remaining five once a fortnight. Each of the nine sorts of stuff is kept, and treated separately on suitable dressing machines.

At the Altenberg Zinc Mines, near Aix la Chapelle, the ore consisting of calamine, associated with dolomite and clay, gives rise to a considerable quantity of viscid material in the lower grades of stuff. Grains ranging in size from one millimetre downwards are, however, successfully classified by means of a continuous stream-launder, the general arrangement of which is shown in Fig. 3. The total length of the apparatus is 45 ft.; the outside width at the small end 22 in., depth 30 in., witdh at large end 8 ft., depth 6 ft. 6 in. The water and slime flow from the narrow to the wide end. Diluting water is introduced along the whole length of the stream-launder by means of a side launder fitted with pipes ¾ in. in diameter. These pipes, each about 10 in. long, enter between the outer and inner trough. The slot holes in the angle of the stream-launder allow the classified sand to pass to the bottom of the outside trough, from whence it flows through syphon-shaped tubes to 12 fine sand jiggers. About 55 tons of solid matter enter the slime-launder in a period of 10 hours, 45 of which is effectively classified and drawn off by the syphon pipes, the other 10 tons flow to the slime pits. In this instance the fine sand jigging-hutches are only furnished with two sieves, each bottom being 2 ft. 6 in. long and 14 in. wide. The grains of the finest sand jigged are about one-hird of a millimetre in diameter, and requires a stroke in the piston of one millimetre and about 210 strokes per minute.

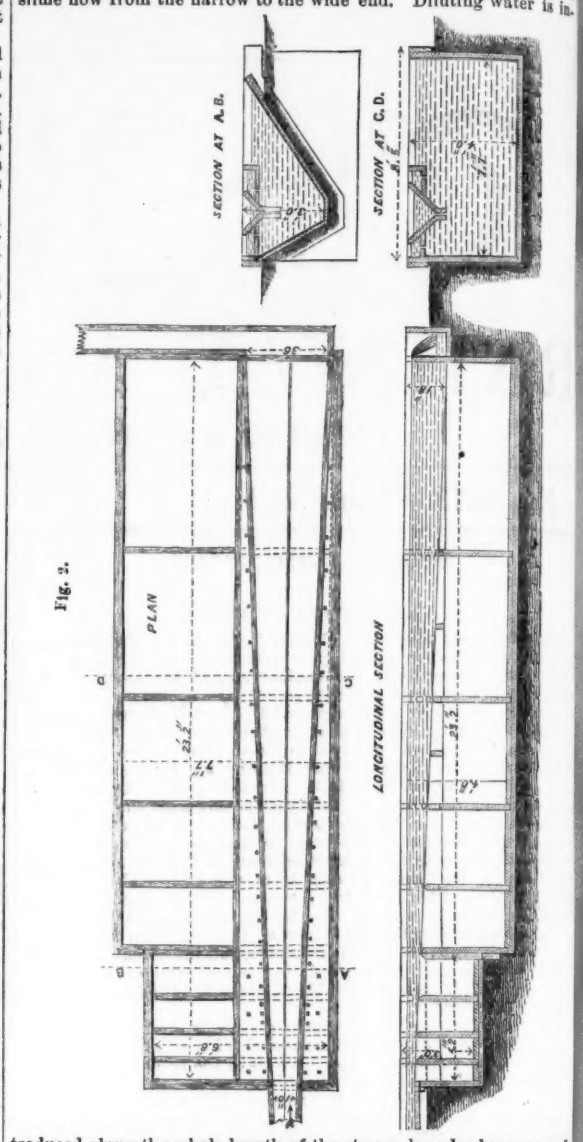
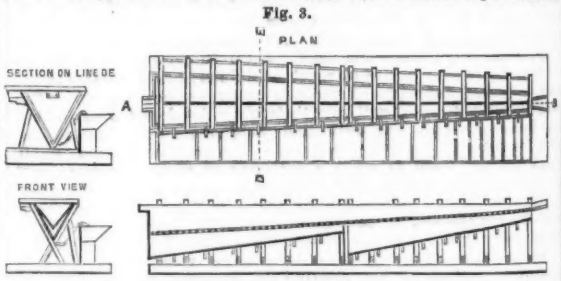


Fig. 3.



Coleman-street-buildings, London. JOHN DARLINGTON.

WEST CHIVERTON MINING COMPANY.

SIR,—When I last troubled you in reference to this mine, about the time the spring quarterly meeting should have been held, my letter was replied to by an official communication to the effect that there was no foundation for the disconcerting rumours as to the financial condition of the mine, that the usual dividend would be declared, but that it had been rendered necessary to postpone the meeting on account of the frosty weather having interfered with the dressing operations. What do we now find to be the result? A dividend of 2*l* per share (the usual amount) was declared, but the costs were in arrear one month; and at the meeting held last week the ugly fact was disclosed that, while the lead sold up to the end of June was credited, the costs were charged up only to the end of March, besides which the bills given by lead merchants on the purchase of lead ore being always payable three months after date, those for June will not come to maturity until September. Why, under these circumstances, a dividend of 1*l*. per share was declared it is not easy to divine, the more especially as it is perfectly clear that to enable the committee to pay the amount the ore-bills must be discounted. Had the mine sufficiently improved to justify the hope that during the current quarter one month's additional cost (3000*l*.) could be liquidated, the declaration of the dividend would have been admissible, but there is the authority of the agents for the statement that, although the bottom of the mine had very much improved, they should not like to pledge themselves to such increased returns.

I personally thank those of my fellow-shareholders who attended the meeting, and urged a different course, for I do not agree with those who contended that, under such circumstances, the non-declaration of a dividend enabling the committee to charge up one month's costs would have so adversely affected the market price of the shares as the course adopted. If at the spring meeting it was not deemed an imprudent policy to credit four months' ore against three months' costs, and, at the same time, declare a dividend of 6000*l*. (2*l*. per share) —an amount equal to two months' costs—why should any objection now be urged against the much more prudent policy of placing four months' costs against three months' returns, thereby placing the accounts in that position which the committee had always previously held as essential to a sound financial position? Now that the committee have so largely reduced their stake in the mine, it becomes a question whether it is not the duty of those into whose hands the shares have passed to come forward and form their own executive.

July 10. A SHAREHOLDER.

MINING IN CARDIGANSHIRE.

SIR,—My absence from home for the last few days has prevented my reporting on the mines north of Goginan, as promised in my last letter; but I will try and do so next week. On looking over the Journal for the last two weeks I find some remarks from "A Subscriber" on my having spoken concerning the Cornish and Devonshire agents coming into this county to inspect and report upon the Cardiganshire mines. These remarks were backed the following week by the Rev. Mr. John Roberts, of Pen-y-Groes, N.W. I should be glad for any person to point out the mistake I am supposed to have made in making use of my advice to shareholders. I will say it again that the greatest and most experienced mine agents of either of the above-mentioned counties, upon their first visiting this part of the world can give no mining speculator a proper report, from the want of knowing the country. I am a Cornishman, and my fathers before me, and I am at all times glad to meet my neighbour, let him be Cornish, Welsh, or of any other country in the world; but it is wrong for anyone to write, as the Rev. Mr. John Roberts does, of my being anxious to obtain the fees that might be paid to others coming to inspect the work of mining agents, both Cornish and

Devon—old standards in the country for thirty years or more. I would tell the rev. gentleman I have never sought any fees, neither have I any for the work which I do. I do it for the good of any mining party who may feel inclined to come into our field without being led astray, and if Mr. Roberts could but peruse my letters for the last two or three years upon Mining in Cardiganshire he would then see for himself the great good that has been done without my receiving any fees.

Now, as regards my connection having been severed long ago from West Bronfloyd Mine. I will ask the readers of the *Mining Journal* if they possess a mine, work, and sell it to a party, as I did to Mr. Henry Sewell for a gentleman for the sum of 3000*l.*, half of which I agreed to take in paid-up shares of the company, 100*l.* of which I suppose was paid, but nothing else has ever been done, neither have I ever seen the colour of the money, besides the last six months' salary I laboured for there, and if I do not still belong to that mine, who then can be secure? SAMPSON TREVETHAN, Mining and Consulting Engineer.

Rheidol Cottage, near Aberystwith, July 12.

TERRAS TIN MINE.

SIR,—In the Supplement to the Journal of July 1 there is an article by "Wonderer" on the produce of tin in the stuff. It is true my report stated that stuff from 300 to 400 lbs. to the ton had beeen brought up, but it was never intended to convey the impression that this was an average of the whole of the elvan in bulk. And the further improvement spoken of applied more particularly to the "tin being more generally disseminated throughout the whole mass, and that the softer portions of the elvan were equal in richness to the harder rock." "This further improvement" is unwarrantably set down by "Wonderer" at 600 lbs. of tin to the ton of stuff," and calculated upon accordingly. Allowing only 12 cubic feet to the ton, "Wonderer" is either ignorant of the business or guilty of a wicked perversion of facts; 14 cubic feet of granite proper makes 1 ton, 18 feet of Terras elvan, giving allowances for the softer or more friable portions of it, makes 1 ton, so that "Wonderer" in this particular is sadly out of the way of truth.

The object of "Wonderer" is too transparent to need further comment, but should "Wonderer," or any other wonderer, feel dubious as to the produce of tin in the stuff, we invite them to come and see for themselves; we can show them stuff not only 60 per cent., but over 75 per cent., with the privilege of taking the stuff from the lode with their own hands. I am now speaking of the bottom of the 20, at Edwards's; we do not intend to say that this is an average of the stuff from the lode, but taken from the richer portions of it, and the same applies to the elvan, and which we are pleased to say has greatly improved in depth, and continues to hold good in going down, and it will be no great wonder if it still further improves. MARTIN RICKARD.

TERRAS TIN MINE.

SIR,—My letter under the above heading, in the Journal of July 1, has elicited two others, the first of which should never have been written, as it contains neither rhyme nor reason, and the second confirms my every assertion, as I suppose the cubic fathom on the third line of the second paragraph is merely a clerical error, and is intended for "ton."

Mr. Rickard has week after week and month after month dinned into our ears the richness of the stuff in the bottom of the deep level in the elvan, and now see what he says in the report dated June 28—that this part of the mine is richer than ever, and that when fully opened out, so that the 48 heads of stamps can be supplied from this source, the returns of tin will be more than doubled. Sir, with a childish faith have I all along built on the statements of this gentleman, like the fabled milkmaid of old have I counted up my chickens; I have reckoned up by day—aye, dreamed of by night—the time when these statements would be fulfilled, when a few score shares should represent a competency, and now, alas! it is the old story of the mountain in labour bringing forth a mouse. I am stunned with the information that the returns will be more than doubled, that in place of some 6 tons in two months there will be, after a pretty long time in opening out this part of the mine, a bi-monthly return of 12 tons of tin, valued 1000*l.* Sir, allow me one moment more, and I have done. I would ask Mr. Rickard does the stuff average in bulk 200 lbs. to the ton (I want to keep below the mark), will 48 heads of stamps do 50 tons of stuff per day? and, assuming now that he will answer in the affirmative, we have some 26 tons of tin, representing 200*l.* per week. A WONDERER.

[For remainder of Original Correspondence see to-day's Journal.]

Meetings of Mining Companies.

THE POLBREEN MINING COMPANY.

A general meeting of shareholders was held at the account-house at Polbreen, in St. Agnes, Cornwall, on July 7,

Mr. Y. CHRISTIAN in the chair.

After the usual formal business had been gone through, the statement of accounts, embracing mining operations and tin obtained during the four months ending April 30, was submitted. This showed an expenditure in labour and materials for that period of 2166*l.* 5s. 8d., and a payment for lord's dues of 93*l.* 14s. 2d. Nearly 20 tons of tin had been sold, realising 1874*l.* 4s. 4d. The balance remaining against the adventurers was 628*l.* 18s. 1d. The report presented by Captain John Nancarrow, the mining engineer and manager, was then read, as follows:—

July 7.—Previous to making my statement as to the actual and existing very satisfactory condition of the Polbreen Mine, I think it will be better that I should endeavour to give you an idea of the vast amount of work that has been done within and upon the mine since the date of the last general meeting, which it will be recollected was held on Friday, March 24. The items are numerous and important, and the cost has been great; but the result will be economy in every process, and larger profits to the shareholders. At surface we have built additional slime-pits at the dressing-floors; constructed two sets of trunks there, now in full course of working; laid out new dressing-floors at the burning-house, with buddles, frame, &c.; built a great length of wall to enclose them all; and repaired the tin-house. Underground, besides the usual driving, sinking, rising, &c., we have at Christian's shaft cut a large plat at the 22, and laid down a railway in that level that will greatly facilitate the discharge of stuff. We have also put Thorpe's shaft in order for drawing from the 32 fathom level.—South Lode: Here we are stoping and rising on tribute and tutwork, and the present appearance of the lode justifies the expectations entertained respecting it.—Dorcas Lode: The lode is small in the 12 fathom level west, but it is a very promising end, and likely to improve. The tribute department in this lode looks very encouraging. There are eight pitches at Chew's, Christian's, and Thorpe's shafts, in the ground that was being worked four months ago.—Tregay's Lode: The lode in the 22 west is improved, is larger, lets out more water, and yields good tinstuff. The rise east of cross-course is up several fathoms in tribute ground. The 22, east of the cross-course, is improved, contains rich copper and some tin; now worth 15*l.* per fathom. The 22, west of cross-course, is opening out tribute ground. We have cut into the lode above the 32, west of cross-course, and find it to look exceedingly well, and to be worth 20*l.* per fathom; there are two pitches on this lode, and we expect to set more shortly.—Flat Lode: The lode is better in the 12 east than it was at the last meeting, and the pitch near the end is improved. There are three pitches by eight men. A cross-cut is being driven towards this lode at the 22.—General Review: There are 14 pitches worked by 34 men, at an average tribute of 10s. in 1*l.*; there are 20 men on tutwork, and 41 men, boys, and girls engaged in the various departments of surface work and dressing: total employed, 95 persons. We have sold since the last meeting 23 tons 16 cwts. 0 qr. 6 lbs. of black tin, which has realised 1874*l.* 4s. 4d., and have now 9 tons broken on the mine. The cost in the four months now accounted for has been very heavy, owing to the extra expenditure referred to in the report presented at the last general meeting. This great outlay in materials, in constructions, and in wages necessarily defers the dividend. The monthly cost-sheet is now, however, considerably reduced—that for May being 180*l.* less than the one for February, while, to judge from present appearances, our returns will regularly increase. The prospects of Polbreen were never so good as now, and the mine is on the eve of becoming permanently profitable.

The CHAIRMAN then said he was sure the report just read was so satisfactory in every one of its details that the shareholders present had already made up their minds very little in addition was required from him. Polbreen was evidently bent on keeping faith with those who had trusted to its character. (Hear, hear.) It seemed to be clear that it would pay its first dividend within less than two years from the date when mining proper could be commenced, after the mine had been relieved from water and all the shafts cleared and secured. The great point on which the shareholders had to congratulate themselves was that the quality of the Polbreen tin had turned out to be as good as it was always said to be. Whenever they had tin to sell they always got the top price of the day, and there was no reason to doubt they would still continue to do so. (Hear, hear.) It would be very hard, if not impossible, to name a mine in the whole county that had made such advances in the same space of time as their mine had done. And what had been done, it must be recollected, had been done in the face of two most unfavourable winters. As to the late season, there had not been a mine meeting held this year at which the last long and altogether extraordinary winter had not been appealed to as an apology for delay and diminished returns. If this had been the case with old and dividend paying properties, where buildings and dressing-floors, and every other appurtenance, had long been in perfect order, what must have been the increased difficulties thrown upon Polbreen, where all that he had mentioned had yet to be done? (Hear, hear.) The committee, however, had resolved that the promise given to the shareholders when the call was made should be kept to the letter if possible. In that resolve they had been ably and energetically assisted by their excellent manager, Capt. Nancarrow. To effect what had been attained had been a most expensive task, for the work had been carried on in spite of all impediments. Still there they were, as the report had stated, on the very eve of dividend. Their monthly cost-sheets had actually been over and over again considerably above 500*l.* per month. He hoped now to see them permanently at something like 300*l.* per month, and he need not say how ample and secure would be their dividends when that was the case. (Hear, hear.) It was hardly possible to state at that moment what might be the importance of the step gained even during the past week. The lode in the 32 west had been cut into, which was the object they had been pursuing for a period of some duration. The 9 tons of tin mentioned in the report as now on the mine and broken would be sufficient to more than pay the debit shown in the statement of accounts, and with the expenditure greatly diminished, and the returns of tin more than proportionately increased, Polbreen would be very soon in a condition to reimburse the outlay made on it, and nobly repay the shareholders for their patience and confidence. The price of tin was happily altogether in their favour, and bade fair to remain so, not for months, but he believed for years.

The report having been adopted, a SHAREHOLDER put a question respecting the "rich copper" that was stated to have been met with in Tregay's lode, and a splendid specimen of which was then lying in the account-house. He desired to know how this discovery was supposed to affect the general character of the mine?

Capt. NANCARROW replied that the meeting with copper of that description in a tin mine was always considered an indication that an abundance of tin would follow. That opinion was confirmed, as he knew, by several mining authorities, who had inspected the surface works that day, and had been struck by his description of the position in which the copper had been met with.

The committee were then re-elected, and a vote of thanks to the Chairman closed the proceedings.

THE WEST POLBREEN MINING COMPANY.

A general meeting of shareholders was held at the account-house of the Polbreen Company, on July 7,

Mr. Y. CHRISTIAN in the chair.

The statement of accounts showed an expenditure for four months, down to April 30, of 241*l.* 7s. 1d., leaving a balance in favour of capital, after paying for the lease of the mine and all preliminary expenses, of 3960*l.* 12s. 11d.

The report presented as regards the operations on the mine was as follows:—

July 7.—Since the commencement of operations here we have erected a whim, cleared and secured the shaft to the adit level, substantially divided and cased it from surface, and put in a good footway, which is complete to the bottom. We have also cleared the levels throughout their whole length, securing them with timber where it was necessary, and have built a changing-house for the men, which serves also as a receptacle for materials, &c. In the underground operations three lodes are laid open, two of which are reached by cross-cut from the south lode, 22 fms. west of shaft. We are now driving on each of these at the adit level.—South Lode: This lode is worked from the eastern boundary, 40 fms. westward. All the lode is taken away in back of this level from the boundary to within 7 fms. of the end, and in the bottom to within 14 fms. of the end, and above and below the level for a considerable distance east of the boundary in Polbreen also, and is known to have yielded a great quantity of tin. The lode in the end has been split, but is getting more settled, improving in quality, and yielding tin to save.—Middle Lode: This lode is 9 fms. north of the south lode, and is opened on for the length of 9 ft. only. It is of a rusty character and composition, similar to that in which large quantities of tin have been broken in the Polberro Mines, to the north. It promises well, and the stuff now being broken on this lode is about equal to the average of tinstuff in the county.—North Lode: This is 18 fms. north of the middle lode, and is evidently the Dorcas lode which has been so rich in Polbreen. It is here opened on for a length of only 8 ft. There was no tin when we commenced, but there is now a fine strong lode, which is improving as we drive. The position of West Polbreen is such as not to leave a doubt about the store of mineral within its bounds. Our operations up to the present date consist entirely of driving on those lodes that offer the best prospects of success. We are meeting with tin in some considerable quantity already, though our mining work could be entered on only six weeks back, so that the adventurers may entertain a reasonable confidence of being well rewarded for their outlay.—JOHN NANCARROW.

The CHAIRMAN said it was a matter of great gratification to him that the report just read would convince every shareholder that not a moment had been lost in setting to work. The accounts spoke plainly to the fact that even an outlay of under 200*l.* on the real work of mining had effected wonders, and led the committee to proceed with greater boldness to further expenditure. What had been done had confirmed every anticipation as to the economy with which West Polbreen could be worked. Enough had been accomplished at surface to enable them to go on for some time without much more cost; though no doubt as the mine began to make its returns of ore so they would have to provide all that was necessary for treatment before their produce could be sent to the smelter. What he had seen at Polbreen that day had increased his certainty of the value of the property that belonged to the shareholders in West Polbreen. They were getting tin in some quantities after only six weeks of real mining. The thing was almost unprecedented in the later history of Cornwall, and he firmly believed their progress to dividend would be as rapid and as unexampled as had been their immediate falling in with ore. (Hear, hear.) Still, he would remind his hearers that West Polbreen had not been recommended to their notice without an amount of examination into the history and mineral capabilities of the sett that had justified the prediction contained in the original prospectus that one at least of the lodes would be reached with not more than three months' labour. It had been done in less than six weeks, and he was inclined to hold that many more agreeable surprises of the same kind were in store for the adventurers in West Polbreen. (Hear, hear.)

After a few remarks from a shareholder, expressing confidence in the progress of the mine, the usual acknowledgment to the Chairman put an end to the meeting.

EAST POOL MINING COMPANY.

At a meeting of adventurers, held at the mine on Monday, the accounts for April and May showed a profit of 1620*l.* 7s. 6d. A dividend of 1600*l.* (5s. per share) was declared, and 37*l.* 8s. 1d. carried forward.

In reference to the financial arrangement of a suspense account, as submitted in the statement, the committee desire their co-adventurers to understand clearly that, in conjunction with the manager, they concluded on such a step for the two following reasons:—That on the completed erection and working of the draft engine and boiler, with its house and the appurtenances, in about four or five weeks, all outlay connected therewith, whether of purchase or of labour and materials, will be speedily recouped by increased returns. Furthermore, by such simple and purely temporary arrangement, the necessity of either reducing or suspending the dividend for a single account is obviated.

The following report from the agents was read to the meeting:—

July 10.—Great Lode: The engine-shaft is sunk 3 fms. below the 180, and the plats cut to that depth. The 180 is driven east of the cross-cut 12 fms., and is worth for tin 20*l.* per fm. The 180 is driven west 11 fms., and is worth 24*l.* per fathom; this level is still free from wolfram. One stope in the back of this level is worth 24*l.* per fm. The 170 is driven east 46 fms., and is worth 18*l.* per fm. The 170, 11 fms. west of the cross-course, is worth 12*l.* per fm. There are four stopes in back of the 170—two east worth 20*l.* per fm., and two west worth 16*l.* per fathom each stope. The cross-cut south of the 160 west is driven 20 fms.; no lode yet cut. The winze below the 130, on Pryce's lode, which is designed to communicate with this end, is down 23 fms., and is sinking on the south part of the lode, which is producing stones of copper ore. The winze below the 160, 40 fms. east of the cross-cut, is holed to the 170. The winze also on the engine lode, 10 fms. east of the cross-cut, is holed to the 170.

South Lode: The 150 is driven west of the south cross-cut 9 fms., and is worth for tin and copper 10*l.* per fm.; to facilitate the working of this level we have commenced a cross-cut on the cross-course at the 140; it is driven 2 fms. south of the engine lode. The 130 is driven 32 fms. east of the western cross-cut; the lode in it is large and promising, and worth for tin and copper 15*l.* per fm. We have commenced a winze 15 fms. before this end below the 100; it is down about 3 fms.; the lode in it is small, producing stones of tin and copper. The 60 fm. level, 10 fms. west of the south shaft, driving south to cut the part on which the tributers are working, is driven 5 fms. from the north part of the lode. The three stopes in the bottom of the 130, as well as the tribute ground in the upper levels, are looking quite as well as they have been before reported. The house for the new whim is nearly completed, and we hope to begin to heave in the engine by the 24th instant.

Since the last meeting of the adventurers we have found it expedient, after mature deliberation, and in order to guard against the probability of a sudden influx of water in this mine, by the suspension of Great South Tolgus and the eastern engine in Wheal Agar, to recommend to the committee, and with their concurrence and authority, as also that of the lord's steward, to purchase intact the pumping-engine of Wheal Tehidy, an intermediate sett, and also a suspended one, to be used in case of necessity. In order to be in a position to cope immediately with any such influx of water, it became prudent without delay to prevent the drawing of the required pitwork at Wheal Tehidy by a prompt purchase of the engine entire; at the same time we have to report that we have already built a dam at the 40 in that mine, and have obtained permission, in case of need, to construct another in Wheal Agar sett.—W. S. GARBY, Manager, J. MAYNARD, J. HOSKING.

THE GWYDYR PARK CONSOLIDATED MINING COMPANY.

The following report from Mr. Jehu Hitchins will be presented to the meeting of adventurers to be held at the offices of the company, on Thursday:—

THE GWYNLLIFION, FUCHUSLAS, AND THE TYNTWLL LEAD MINES.

June 24.—On examining these properties, at Gwynllifion I find the stopes west of Sutton's shaft, in the bottom of the shallow adit, a little improved, now worth 8 cwts. of lead ore per fathom; working by four men, at 3*l.* 10s. per fathom. This leaves little or no profit, but as there is a chance of improvement we continue to work; although the lead here has disappointed us hitherto, the ultimate result may do more than I dare promise. On Owen's lode the late dry weather has permitted trials to be made, and two men are now employed stoping in the bottom at 3*l.* per fathom; in which the lode is also improving, now yielding 10 cwts. of ore to the fathom, and as report has represented that it is a good and productive lode, we propose to extend our field of operations here next mouth, and hope for good results. We shall also try on the Shoemaker's lode, which is also well spoken of.

At Fuchuslas the smiths' shop end is driving south by four men, at 8*l.* per fathom—a high price, as the ground here is hard, and the lode in consequence small and unproductive. Our object is to reach a point under a good lode in the level above at about 4 fathoms in advance, where we have reason to expect an improvement. At Harker's lode also we have a hope of better things; there is ore, but not enough to make a profit as yet. Here, as also at Gwynllifion, we have agreed to recommend such trials only as are likely to lead to immediate results, and to confine the costs to a minimum effective scale, and to avoid mere speculative operations. We have here altogether about 9 to 10 tons of ore, which will be ready for sale soon.

Tyntwll.—At this newly-acquired mine our prospects, I am happy to say, are very much better. The main lode, which runs north and south, with an underlie east, is intersected at the engine-shaft by the deep adit driven in from the road from Trefriw to Llanrwst on an east and west lode, which has yielded some ore, and there is still some to be seen, but not enough to pay for excavating. This adit is 23 fathoms deep, in the back of which, for some 50 fathoms, most of the lode is taken away almost to surface, excepting in one place near the south end, where there is a stope of ground showing the lode for 15 in. or so wide, worth about 16 cwts. of ore per fathom, going away in whole ground and ready to work upon. Both ends of this deep adit although unproductive, are not without ore and promise, but the containing rock is hard. The bottom of this mine is 15 fathoms deeper, to which the lode is also mostly worked away, but more so south than north of the shaft. The deepest level is driven north (say 15 fms.) into very hard ground, in which the lode shows as improving, having some lead ore, so that it is a speculation to continue it. South of the shaft this level is driven east of the lode, to which a cross-cut is communicated. Hereabout, at 20 fms. from the shaft, the lode in different places, both in the bottom and breast end of the stopes, shows good lead ore for a good portion of this height up to the deep adit, in one place worth 2½ tons to the fathom, and will average nearly 1 ton; however, the upper part cannot be so closely examined until the mine is a little more laid open. All this is going away in whole ground south, and it appears that the nature of the lode and containing matrix is here more congenial both for ore and working. On the other two east and west lodes some workings have been made, in which on the No. 2 or middle one some ore is to be seen, but not of much value to work. It, however, shows the mineral character of the locality; and on the south one I am informed that the last man who worked there states that a shaft has been sunk (which I saw) to about 10 to 12 fathoms deep, and a level driven both east and west, and the lode therein had a solid leader of lead ore 10 in. wide. On this lode was a water-wheel to work the pump to drain the mine, to which was attached an ore crusher, for dressing the said ore, all which I myself have some years since seen, but all now taken away, having been stopped when the other part of the mine ceased. Judging from what we find in the north and south lode, I believe that this one will be found, if opened upon, to be also productive. Our steam-engine, which we have adopted as the readiest means to clear the mine, works exceedingly well and keeps the water with great ease, and is of sufficient power to draw the stuff also, as well as to crush the ore for dressing, if required, for some time to come, until we can apply the water-power here available to these purposes more economically, which in due time I advise. Upon the whole, I am very favourably impressed with the general appearances of this concern, and should the lode continue as I expect it will, we shall make good profits. JEHU HITCHINS.

[For remainder of Meetings see to-day's Journal.]

GRYLLS'S ANNUAL MINING SHEET,

FROM JUNE 30, 1870, TO JUNE 30, 1871,

Showing the Quantity of Copper Ore sold from each Mine, British and Foreign—Average Price per 21 cwts., and the Amount of Money—The Average Standard, Produce, and Price for the Year, both in Cornwall and Wales—The Total Amount of Ore, Fine Copper, and Money—Each Company's Purchase—And the Particulars of Copper Ores sold at the Ticketings in Cornwall from June 30, 1852, to June 30, 1871:—

CORNWALL.

Mines.	Ore.	Amount.	Price.
Bampfylde ....Tons	58	£ 714 17 0	£12 6 6
Basset, Wheal	671	2,913 7 6	4 7 0
Bedford United Mines	865	2,790 9 0	3 4 6
Brookwood	1,631	6,639 18 0	4 1 6
Buller, Wheal	66	428 6 0	6 10 0
Carn Brea Mines	1,485	5,747 12 0	3 17 6
Carn Camborne	380	921 18 0	2 8 6
Champion's Ore	57	259 19 6	4 11 0
Clifford	465	1,216 8 0	2 12 6
Copper Hill	141	759 9 6	5 7 6
Craddock Moor	678	3,419 19 0	5 1 0
Crebor, Wheal	369	1,256 3 6	3 8 6
Crelake, Wheal	286	703 14 0	2 9 0
Crenver and Abraham.	1,502	4,337 11 6	2 18 0
Devon and Cornwall	144	447 8 6	3 2 0
Devon Great Consols	17,490	49.263 1 6	2 16 6
East Basset	68	333 17 6	4 18 0
East Caradon	2,587	11,724 10 6	4 10 6
East Carn Brea	312	1,086 15 6	3 9 6
East Grenville	1,112	3,895 16 0	3 10 0
East Pool	2,125	5,814 0 0	2 14 6
East Seton	190	981 19 0	5 3 6
Emily Henrietta, Wheal	98	547 3 6	5 11 6
Florence and Tonkin	52	179 6 6	3 9 0
Franco Consols	98	175 3 6	1 16 0
Friendship, Wheal	1,160	6,674 19 0	5 15 0
Fursdon	100	407 10 0	4 1 6
Gawton Copper Mine	1,173	3,562 4 0	3 0 6
Glasgow Caradon	1,366	5,942 8 6	4 7 0
Gonamena	492	1,697 10 0	3 9 0
Gunnislake (Clitters')	1,095	5,284 6 6	4 16 6
Hingston Down	391	2,010 9 6	5 3 0
Jewell, Wheal	83	259 14 6	3 2 6
Kelly Bray	1,035	2,873 13 0	2 15 6
Levant Mine	50	477 16 6	9 11 0
Marke Valley	5,889	20,568 1 6	3 10 0
Mellanear	364	2,373 14 6	6 10 6
New Pembroke	608	4,765 14 0	7 17 0
North Downs	568	2,753 4 0	4 17 0
North Treskerby	987	4,719 9 0	4 15 6
North Wheal Crofty	297	1,862 13 6	6 5 6
Okel Tor	563	936 17 6	1 15 6
Phœnix Mines	1,622	6,807 6 6	4 4 0
Poldice Mines	388	1,393 2 0	3 12 0
Prince of Wales	923	4,829 16 6	5 4 6
Russell, Wheal	863	3,915 4 6	4 10 6
Seton, Wheal	1,764	6,230 12 0	3 10 6
South Caradon	6,538	39,735 12 0	6 1 6
South Crofty	1,642	3,863 16 6	2 6 6
South Frances	636	3,135 11 0	5 3 6
Sundry small mines, &c.	686	3,188 12 0	4 13 0
Virtuous Lady	237	1,259 8 6	5 15 0
West Basset	982	5,287 18 6	5 7 6
West Caradon	659	2,536 11 6	3 17 0
West Damsel	626	2,129 4 6	3 8 0
West Maria & Fortescue	1,267	4,522 9 0	3 11 6
West Seton	4,206	20,466 17 0	4 17 6
West Tolgus	2,208	8,991 2 6	4 1 6
WALES.			
Australian Ore	170	£ 1,536 15 6	£ 9 1 0
Ballycummisk	105	453 15 0	4 6 6
Berehaven	2,746	14,675 15 6	5 7 0
Bradda	87	387 6 0	4 9 0
Brass Ashes	526	1,231 12 0	2 7 0
Cape Ore	5,148	102,220 18 6	19 17 0
Copper Ore	706	7,289 16 6	10 6 6
Copper Regulus	348	4,665 15 0	13 8 0
Copper Slag	296	395 13 0	1 6 6
Cuba Ore, &c.	194	3,272 19 6	16 17 6
Dyfngwm	55	288 15 0	5 5 0
Dyliffe	120	448 8 0	3 14 6
Knockmahon	3,110	15,706 1 6	5 1 0
Lisbon Ore	388	5,809 3 6	14 19 6
Michell's Ore	63	184 5 6	2 18 6
Mixture	198	1,046 16 0	5 5 6
Moonta Ore	4,176	41,152 15 6	9 17 0
Paramatta	2,075	21,799 4 0	10 10 0
Precipitate	106	3,610 5 0	34 1 0
Sobral	147	1,345 6 0	9 3 0
Sundry small mines, &c.	91	1,259 16 0	13 17 0
Telhadella	322	3,902 2 0	12 2 6
West Canada	636	7,892 15 0	12 5 6

Copper Ores sold in Cornwall, from June 30, 1870, to June 30, 1871.

Copper ores	74,367 (21 cwts.)	Average produce	6⅛ 1-16
Fine copper	4,987 t. 17 c.	Average standard	£99 11 0
Amount of money	£292,122 4s. 6d.	Average price	3 18 6

Compared with the previous year,

Copper ores—decrease, 15,860 (21 cwts.) | Fine copper—decrease, 1327 tons 18 cts.
Amount of money—decrease, £82,489 16s.

Copper Ores sold in Wales, from June 30, 1870, to June 30, 1871.

Copper ores	21,813 (21 cwts).	Average produce	17⅛
Fine copper	3,734 tons 18 cts.	Average standard	£77 10 0
Amount of money	£240,483 19s. 6d.	Average price	11 0 6

Compared with the previous year,

Copper ores—decrease, 1,342 (21 cwts. | Fine copper—increase, 246 tons 14 cts.
Amount of money—increase, £16,070 2s. 6d.

Totals in Cornwall and Wales.

Copper ores ..... 96,180 (21 cwts.) | Fine copper ..... 8722 tons 15 cwts.
Amount of money, £532,606 4s.

Compared with the previous year,

Copper ores—decrease, 17,202 (21 cwts.) | Fine copper—decrease, 1081 tons 4 cts.
Amount of money—decrease, £66,419 13s. 6d.

Purchased by Copper Companies from June 30, 1870, to June 30, 1871.

Purchasers.	Tons ore.	Tons copper.	Money.
Vivian and Sons	19,079	1510 7	£90,636 16 0
John Freeman and Copper Co.	699	72 9	4,536 7 9
Pascoe Grenfell and Sons	10,785	1168 5	72,917 18 6
Sims, Willyams, Nevill, and Co.	8,862	999 17	61,275 8 4
Williams, Foster, and Co.	21,532	2023 7	124,640 6 8
Mason and Elkington	11,659	963 15	58,509 14 4
Bankart and Sons	2,984	149 13	8,820 14 6
Copper Miners' Company	5,841	513 7	31,129 0 5
C. Lambert	6,517	444 16	26,127 1 3
Newton, Keates, and Co.	309	22 5	1,418 5 3
Sweetland, Tuttle, and Co.	7,398	683 4	42,294 15 0
British and Foreign Copper Co.	383	128 8	8,412 16 6
Ravenhead Copper Company	152	38 2	2,486 19 6

Sold at the Ticketings in Cornwall from June 30, 1852, to June 30, 1871.

Date.	Ore (21 cwts.)	Money.	Produce.	Standard.
1852	152,802	£ 828,057 19 6	7⅛	£101 0 0
1853	180,095	1,124,561 2 0	6⅝	106 12 0
1854	180,687	1,153,756 3 6	6½	136 16 0
1855	188,969	1,212,686 8 0	6½	140 2 0
1856	209,305	1,283,639 8 6	6⅜	141 10 0
1857	198,697	1,276,844 12 0	6½	140 0 0
1858	183,292	1,083,728 18 6	6⅜	129 6 0
1859	183,944	1,079,075 17 0	6⅜	133 6 0
1860	180,448	1,079,403 4 6	6½	133 18 0
1861	176,097	1,013,400 5 6	6½	130 1 0
1862	186,662	977,017 2 6	6¼	127 13 0
1863	176,285	872,474 4 6	6⅜	120 9 0
1864	166,707	858,586 1 0	6¼	124 17 0
1865	164,940	806,833 10 0	6⅜	125 3 0

Date.	Ore (21 cwts.)	Money.	Produce.	Standard.
1866	148,777	678,641 3 0	6⅛	118 7 0
1867	125,679	547,689 8 6	6⅛	107 1 0
1868	121,815	554,029 19 0	6⅛	110 15 0
1869	103,199	430,749 10 6	6¾	103 3 0
1870	90 227	374,612 0 6	7	98 12 0
1871	74,367	292,122 4 6	6⅛	99 11 0

THE MANUFACTURE OF RUSSIAN SHEET-IRON.

Russian sheet-iron has always enjoyed a certain celebrity in the markets of the world, and its excellence has frequently been attributed to the use of an altogether exceptional quality of raw material, combined with a peculiar method of manipulation, the details of which were carefully kept secret; though at various times during the last 30 or 40 years ample details have been published to enable the practical iron manufacturer to carry out the process, provided facilities for the manufacture of good charcoal iron existed, and labour was sufficiently cheap to render its production remunerative. Dr. PERCY, of the Royal School of Mines, has now published a short memoir* containing all that he has been able to collect upon the subject, and has thus rendered a most important service to the iron manufacturers of the kingdom generally, and to the tin-plate manufacturers of South Wales in particular. The Russian sheet-iron in question is remarkable for its smooth, glossy surface, which is dark metallic grey; and on bending it backwards and forwards with the fingers no scale is separated, as is the case with sheet-iron manufactured in the ordinary way by rolling; but on folding it closely as though it were paper and unfolding it, small scales are detached along the line of the fold.

An analysis made at the School of Mines laboratory shows the absence of sulphur and phosphorus, the presence of copper and chromium, and likewise of carbon, which latter appears to increase in proportion as the sheet is reduced in thickness. This, Dr. Percy thinks, may reasonably be accounted for by the method of manufacturing Russian sheet-iron—the sheets are interstratified with charcoal powder and bound up in packets, each of which is subjected to repeated hammering; hence it is easy to conceive how fine particles of charcoal should be beaten in over both surfaces of each sheet. There appears to be no doubt that the superiority of the Russian product is, as Prof. Pumpelly (of Harvard University, U.S.) states, due in great part to the cleanliness of the work, and to the carefulness and skill of the workmen. Dr. Percy gives descriptions obtained from Prof. Pumpelly, Mr. Herbert Barry, Capt. N. Meshtcherin, a Russian mining engineer, Mr. Kokcharoff, whose account was obtained through Mr. N. de Khanikoff, all of whom have watched the process which is freely shown to all visitors, whether Russians or foreigners; and from Mr. Septimus Beardmore, who saw the works, but, as he passed them on a Sunday, not the manipulation. From reading the several descriptions a very complete account of the whole process can be obtained. In the subjoined account the facts are taken from one or other of the authorities already mentioned.

The ironworks wherein the manufacture of this peculiar quality of sheet-iron is carried on are situated on both, but principally on the eastern flank of the Oural mountains. The ores used are magnetite, carbonate of iron (sphaero-siderite), and red and brown hematite, which are smelted with charcoal in cold blast-furnaces. The pig-iron is converted into malleable iron in the charcoal finery, or sometimes in the puddling-furnace, but the sheets produced from puddled iron have usually been found not to possess the same soundness. The refined iron is rolled or hammered, sometimes partly rolled and then hammered into slabs, called "balvanky," 29 in. long, 5 in. wide, and ¼ in. thick, and weighing from 6 lbs. to 12 lbs. The iron should be more crystalline than fibrous, and should contain sufficient carbon to render it more like steel than iron. This balvanky is put into re-heating furnaces and brought, with a very reducing flame, to a red-heat; they are then quickly brushed, to remove any foreign substances that may have fallen upon them, and cross rolled between rolls, the upper one of which is unconnected with the lower, rolling only by friction. The resulting plates are about 29 in. square, to produce which two or three heatings are necessary, and from 12 to 14 passages through the rolls, which are screwed tighter together as the thickness of the sheet gets less. So far there is nothing particular in the rolling, except that it is conducted very carefully and quickly, so that a gang of workmen in an ordinary shift of 12 hours will turn out from 500 to 600 sheets.

The subsequent part of the process, and that which constitutes its chief peculiarity, is that which communicates to the surface of the sheets the well-known mirror-like glaze of a brown or smoky grey colour. The square sheets just mentioned are arranged in packets of three, heated to redness, and rolled, each packet passing through the rolls about ten times, but just before rolling the surface of each packet is cleaned with a wet broom, usually made of the green leaves of the silver fir, and finely powdered charcoal is strewn between the sheets as evenly as possible. These sheets are next sheared down to 2 archine by 1 archine=56 in.×28 in., and each sheet is brushed all over with a mixture of birch charcoal powder and water, and then dried. The sheets so coated with a thin layer of charcoal powder are piled in packets of from 60 to 80, and bound up with waste sheets, two at the top and two at the bottom. These are heated a packet at a time, in a flame furnace so constructed that the packet can be surrounded by logs of wood, so as to leave as little free oxygen in the re-heating chamber as possible. The packet is heated slowly during 5 or 6 hours, after which it is taken out by means of large tongs, and regularly hammered all over under a kind of tilt hammer, but with a larger face. When the packet has travelled six times under the hammer it is re-heated, and each sheet having been brushed clean is placed alternately between a similar number of cold finished sheets; this second packet being once hammered all over to give the plates a perfectly smooth finish. The packet is then opened and the surface of each plate is again cleaned with a wet broom, and the plates are set separately in a vertical rack to cool; they are then trimmed, weighed, and having been assorted in weights are sorted into firsts, seconds, and thirds, according to their glance and freedom from flaws and spots; they are now ready for market. The actual cost of manufacturing these sheets is 16*l.* or 17*l.* per ton, exclusive of profit, and the average price realised for them at the fair of Nijni Novgorod is about 22*l.* or 25*l.* per ton.

The amount of information contained in Dr. Percy's pamphlet is considerable; and as the book is illustrated with diagrams showing the exact construction of the furnaces, hammers, and apparatus used, every facility is offered for those who are disposed to enter upon the manufacture of imitation Russian iron to do so with the smallest possible risk of failure.

* "The Manufacture of Russian Sheet-Iron." By JOHN PERCY, M.D., F.R.S., &c. London: John Murray, Albemarle street.

NEW METHOD OF TAPPING BLAST-FURNACES USED FOR LEAD SMELTING.

At the smelting works of the Eureka Consolidated Company, in Lander county, Nevada, the Piltz furnace has been in use for nearly a year, and the results obtained by that excellent furnace have been highly satisfactory. A very important improvement has been lately added to this furnace by Messrs. Keyes and Arents, the superintendent and the metallurgist of the company, which increases considerably the already astonishing results obtained with this shaft-furnace. At the same time this improvement can be added, with only slight modifications, to all kinds of shaft-furnaces used for lead and copper-matte smelting; and its introduction is, therefore, of great importance to metallurgists. I speak of the automatic tapping apparatus now in use at the above-named works, which consists simply in a pipe, introduced in the side of the furnace at the bottom of the crucible, from which it slants upwards, ending in a kettle, the upper rim of which is at a level with the height of the lead-bath in the furnace, when the crucible is filled. It is claimed and proved by the actual working of this method of tapping that—

1.—The furnace runs more regularly.
2.—The lead obtained is purer.
3.—"Sows" are prevented.
4.—The work of the smelters is lightened.

These results agree entirely with the theories bearing on the subject, as I shall show hereafter, but a fifth beneficial result might be added—namely, saving of fuel.

When the usual method of tapping a lead-furnace is followed, the blast is stopped and the tap-hole in the bottom of the crucible is opened (sometimes with great difficulty, when metal has cooled in it at a former tapping). The lead, matte, and slag run out into the kettle, the hole is stopped again with clay, or a mixture of clay and coal dust, called "stubbe," and the blast is turned on, and smelting resumed. With the cleaning of the crucible, building up of fore-hearth, &c., this part of the smelting often takes considerable time, and the temperature in the furnace is reduced, so that much fuel is burned to make up the lost heat. Irregularities in the running of the furnace are frequently directly traceable to this cause; and the first commencement of the formation of "sows" occurs also in nearly all cases during the stoppages, when the small doughy masses of reduced metallic iron have an opportunity to stick to the bottom of the crucible, which is no longer protected by a liquid mass. It is well known to every metallurgist that whenever the foundation is laid for a "sow," it is extremely difficult to prevent its rapid growth; and even if the larger parts are broken or chiselled out at every tapping, the iron will continually gain on the smelter.

By the employment of the automatic tap the first formation of "sows" is evidently prevented. Even if there be much iron from the charge reduced to the metallic state, the lumps will not come in contact with the bottom, but will always swim on the lead-bath. Being here exposed to the oxidising influence of the blast, they will be carried into the slag.

It need hardly be remarked that this arrangement for tapping is a continuous one, and that it carries the molten lead out from the bottom of the blast-furnace as fast as the metal is reduced inside. At the same time the lead smelted from the charge above remains in the crucible long enough to give the molten ingredients the required time to react upon each other, and separate according to specific gravity.

The lead obtained must be purer, because it is taken from the bottom of the crucible, where the purest (heaviest) metal gathers, and because the foreign metals iron, zinc, and antimony, are mostly oxidised and slagged before they are alloyed with the lead. The work of the smelters is of course considerably lightened, because, in addition to the tapping, the hard work of removing "sows," loosening the charge in the crucible after tapping, &c., is dispensed with.

I have not seen an extended description of the method here spoken of as yet, but it seems to me that the invention is one of the first importance for lead and copper smelting, and that its benefits to these branches of metallurgy will be found as great as those of the Luermann cinder-block have already proved themselves to the iron interest.

A. EILERS, M.E.

—*Engineering and Mining Journal* (U.S.)

PEAT, AND PEAT CHARCOAL.

The utilisation of peat is a matter that has been constantly discussed in the *Mining Journal* for the past thirty years, yet the commercial development of the peat and peat charcoal manufacture is still unrealised. All necessary details concerning its composition and general properties have been collected, and from time to time excellent samples of fuel, both in the form of condensed peat and peat charcoal, have been made. Considering these facts, the SOUTH WALES PEAT AND PEAT CHARCOAL COMPANY has been formed, to purchase the lease of the Fforch Dwm Peat Works, in Glamorganshire, and to manufacture peat charcoal according to the patented processes of Mr. J. J. Hays and others. It is mentioned that the great difficulty that has hitherto attended peat operations has been the want of a regular supply of dry peat for carbonising and other purposes; this has now been attained by Mr. Hays' patented invention for drying peat at all seasons of the year. The capital of the company has been fixed at 20,000*l.*, in shares of 5*l.* each, of which 8000*l.* (to be paid 1000*l.* in cash and the remainder in fully paid-up shares) is payable for the lease and licenses to use the patents, leaving 12,000*l.* for working capital. From the report of Messrs. Hornor and Hays it appears that the present works will give a profit of 1350*l.* as soon as extra plant and machinery have been erected, and certain repairs, alterations, and additions have been made, the cost of which they estimate at 1900*l.* The new works necessary to produce a return of 3000 tons per annum they estimate at 5882*l.*; and they consider that this quantity of charcoal, taking into account the expense of management, and all contingencies, would leave a profit of 3644*l.* per annum, making 4944*l.* in all, or sufficient to pay a dividend of about 25 per cent. upon the entire capital.

It has been estimated by Mr. W. B. Hays that the gross money value of our undeveloped peat bog wealth, assuming the bog to exist in the form of charcoal saleable at 60s. per ton, is 26,136,000,000*l.*, but he suggests that as the quality of peat is variable, and consequently its value unequal, we may reduce this estimate by one-half and still show an almost incredible result. The peat bogs of Ireland are said to cover as much as one-seventh part of the island; and with regard to the origin of these bogs Mr. Nimmo says—referring to cases where clay spread over gravel has produced a kind of puddle, preventing the escape of waters of floods or springs, and when muddy pools have thus been formed, that aquatic plants have gradually crept in from the borders of the pool towards its deep centre, mud accumulates round their roots and stalks, and a spongy semi-fluid was thus formed, well fitted for the growth of moss, which then speedily appeared, *sphagnum* began to luxuriate, thus absorbing a large quantity of water, and continuing to shoot out new plants above, while the old were decaying and compressing into a solid substance below, gradually replaced the water by a mass of vegetable matter. In this manner the marsh might be filled up, while the central or moister portion, contining to excite a more rapid growth of the moss, would be gradually raised above the edges, until the whole surface had obtained an elevation sufficient to discharge the surface water by existing channels of drainage, and calcutated by its slope to facilitate their passage, when a limit would be in some degree set to its further increase. In mountainous districts the progress of the phenomenon is similar, the pools finding a substitute in the clouds and mists resting on the mountain summits, the summit bogs being distinguishable from those of lower levels by the total absence of large trees, and by their extreme purity.

For the production of 1 ton of peat charcoal almost exactly 10 cubic yards of peat, as it exists in the bog, is required, and Mr. Hays considers it beyond question that the production of charcoal should be the main object of all peat undertakings, when commercial success is essential, as charcoal can be made at a cost of from 15s. to 30s. per ton, and obtains a ready sale at prices varying from 40s. to 80s. per ton; almost all the other products are present in a proportion too small for profitable utilisation. With regard to the uses of peat and peat charcoal, we should certainly attach most importance to their application in connection with the manufacture of iron; but there are many others, such as peat in a compressed form for use on railroads and in our naval and mercantile marine, as charcoal in the manufacture of gunpowder, founders' blacking, and artificial manure, besides its known value as a perfect deodoriser of all sewage and other deleterious matters.

Peat charcoal is in all essential points identical with wood charcoal. The plants of the peat bog consist of vegetable fibres and cells, similar to those of wood, and with the exception of some extraneous substances, which are apt to mix with peat in the process of formation, whilst nothing of the sort can affect the growth of trees, everything is the same. These impurities, however, are in most cases perfectly harmless, and only when present in excess do they become injurious. In a few cases these substances may be in their nature obnoxious, for instance, if they be phosphoric or sulphurous, but they are scarce, and the quantities met with are so small that they are seldom of any importance. Peat charcoal, therefore, will in every respect take the place of wood charcoal; and considering the extensive peat bogs of the country, England is as capable of producing charcoal iron as she was before coal was used, and as other countries are that now export it to England; indeed, peat charcoal is already employed extensively in these very countries for iron-smelting. They have for some time been experiencing the same difficulties that England felt 150 or 200 years ago—scarcity of wood and charcoal—but in most cases, not having coals to fall back upon, they have tried and found that peat will serve exactly the same purpose. There is one important branch of industry in this country to which charcoal of some sort is an essential, and that is the tin-plate workers. Their only available source at the present time is wood, and that is getting every day more scarce, and, consequently, more expensive. They can afford to pay even higher prices for peat charcoal than they now do for wood charcoal, peat charcoal, as is well known, being of much greater value than wood charcoal for their purposes.

The methods proposed for working peat are almost innumerable, the enormous weight that has to be turned over before a single ton is ready for market rendering the utmost possible economy in every part of the process absolutely necessary. Mr. Hays considers the ordinary process of cutting out the turf with the slane, and drying it in the air, to be open to two serious objections; one is the large area of ground which is taken up in drying any considerable quantity, and the other the slowness and uncertainty of the process, because in the most favourable weather several weeks are required to dry the peat, and on the occurrence of a wet season the drying can scarcely be effected at all. It is obvious, he remarks, that to make the working of peat a commercial success the production must be not only on a very large scale, but it must likewise be continuous and uninterrupted throughout the whole year; with air-drying alone, however, neither of these conditions can be complied with. The works of the South Wales Peat and Peat Charcoal Company will be admirably situated for the artificial drying of peat, being in the midst of the South Wales coal field, where mineral fuel can be had at an almost nominal price, whilst they have the further advantage of being surrounded by extensive consumers of charcoal, so that it is confidently anticipated that a constant demand for any supply may be relied upon at highly remunerative prices.

The practical acquaintance of the directors with the business proposed to be carried on is a feature to be favourably noticed in this company, and it would be well if so good an example were more commonly followed; we should then hear of fewer failures in undertakings that properly conducted ought to be successes.

SUBMARINE TELEGRAPH INVESTMENTS.

During the past ten years submarine telegraphy has advanced more than any known science in a like period. The laying of the Atlantic telegraphs, and the establishment of a thorough electrical communication between the continent of Europe and that of America, did more in promoting public confidence in the practicability of submarine telegraph enterprise than years and years of scientific research of the late Prof. Faraday or Sir Charles Wheatstone upon the same subject. In the opinions of these eminent gentlemen, however, only a few placed credence, and regarded their schemes as possible to result in success. Associated with the early advance of the science we find Mr. Cyrus W. Field, of New York, and Sir Curtis Lampson, Bart., firm friends of the submarine telegraphy, and advancing funds for the furtherance of experiments and completion of a telegraph cable that would correspond in a trustworthy manner between Europe and America. The cost of an undertaking of this kind being great so soon as these gentlemen felt themselves convinced they nobly came forward, and placed the largest portion of their wealth at the command of the first Atlantic Telegraph Company. That this company should come partly to grief is a regret in which everyone joins who knows anything of the progress of submarine telegraphy, for never was a corporation formed, maintained, and actuated with more true sense of honour and commercial integrity than the Atlantic Telegraph Company. There are many excuses for the display of incompetency which manifested itself both on board the Agamemnon and Niagara. The telegraph engineer in charge of the cable on board the former vessel had quickly risen from a clerk in an instrument room to a post of great responsibility, and this extraordinary promotion, although well understood in the telegraph world, appeared to the public to arise from the fact of the rapid progress submarine telegraph had made in a few years preceding the departure of the first Atlantic expedition. There is ample evidence of the justice of our remarks if we refer to the late attempts at laying a few short lengths of cable which left this country last year intended to connect the West Indies. Be this as it may, both Sir Curtis and Mr. Field took upon themselves the task of establishing an Atlantic telegraph, and with all praise to them be it stated they have carried out their object after years of patent loss and disappointment.

After the failure of the first Atlantic cable, as it will be remembered, public confidence was much shaken in similar enterprises, and this feeling even went so far as to retard any Government support being forthcoming for required lines, the existence of which would be of paramount importance to this country. The utter failure of Newall's Red Sea telegraph cable also tended to damp public ardour in schemes of the kind. However, it was not until the late Lieut.-Colonel Patrick Stewart, C.B., had laid the Persian Gulf cables which are now known as the Goverment Indo-European telegraph that some amount of public trust was restored; and after working with indefatigable zeal and devotion, Sir Curtis Lampson and Mr. Field succeeded in drawing sufficient capital together for making another Atlantic cable, which was successfully laid under the superintendence of a different class of officials; and subsequently a second cable. These both belong to the Anglo-American Telegraph Company, a corporation ably managed by Capt. Hamilton. After the laying and successful working of the first Anglo-America cable, Sir Curtis, who was always recognised as the fond parent of each enterprise, inasmuch as his liberality had gained him the title, retired; not, however, until he had lost a large sum in the establishment of the Atlantic Telegraph, an event which tended alone to promote the many telegraph cable companies of to-day, the promotion of which brought large fortunes to those engaged in the ventures. Capt. Anderson, one of the oldest captains in the Cunard service, commanded the Great Eastern upon the eventful journies with the Anglo-American cables, and Mr. Samuel Canning, who was the joint and second engineer with Mr. Charles Bright during the attempt to lay the first Atlantic cable, has been more successful than the latter gentleman, as he did actually succeed with the Anglo-American cables, and for this service was very properly knighted; but Mr. Bright received a hasty knighthood too (in Ireland) for his service with the Agamemnon, as the compliment was not so great for Sir Samuel Canning. Captain Anderson, for his duties in piloting the big ship with the cables across the Atlantic, had his titles changed to that of Sir James, as also did Professor, now Sir Wm., Thomson, and Mr., now Sir Richard, Glass, and Mr., now Sir Daniel, Gooch, Bart., M.P. To the public some of these names are quite strange, so that when the emoluments were distributed, which we understand was done under the advice of Sir Charles Wheatstone, F.R.S., there were others who came forward with no less claim for reward for public service than those possessed by the gentlemen we have named above, and accordingly much discontent showed itself. To a few, however, the great and lasting honour must remain for having helped to bring the science to its present zenith; and these may be stated to be Sir Curtis Sampson, Bart., Mr. Thomas Brassey, and Mr. Cyrus W. Field. Whatever the distinguished services of others may be, they must ever remain as those of paid servants; but these gentlemen—the three gentlemen—be it understood, are alone promiment, as also are Messrs. Francis Le Breton and Edward Moon, solely with one object, that of advancing the science, and as the case may be to reap hereafter the benefits of the same; with one exception, however, that of Mr. Cyrus Field, none of those gentlemen who so largely contributed towards the first Atlantic cable ever saw their money return with the successful issue of subsequent enterprises, whilst others have become enriched owing to their connection with the same.

We have now officially quoted a number of submarine telegraph companies, all, more or less, transacting a lucrative business, and returning a fair profit to their shareholders. We should not be wrong in saying that if the thousands of shareholders who staked their money in those companies were aware of the precarious circumstances upon which their fortunes hinge a very sad deflection in the share quotation of many companies would immediately take place. The folly to believe, as thousands of persons do believe, that a submarine cable is an investment which is going to last good for time immemorable, and to credit the practicability of patching up and repairing an imperfect line, seems impossible to a practical mind. As the cables are worked to-day the discovery of a fault is of little moment in its working, so that when we go to buy telegraph stock we do not really know whether we are investing in a genuine or imperfect cable. It is certainly not the object of the companies to disclose the condition of their lines, and not until, as was the case the other day with the Atlantic lines, when they came to a case of dead earth, and no communication, do we hear of faults, flukes, and flaws. Up to the present time every expedition has gone well notwithstanding, save the one now roaming about the West Indies seas, to the humiliation of the shareholders of the West Indian Telegraph Companies. Never existed so much misfortune to any one telegraph expedition as has befallen this one—death of staff, loss of cable, bad weather, may or may not be excuses, but it does seem strange that we hear nothing of the progress of the West Indian Telegraph expedition, now quite one year away to complete a work which, judging from the experience and skill exercised in the Atlantic expedition, ought not to have taken more than six months.

POWER IN MOTION.—The volume just issued, through Messrs. Lockwood and Co., by Mr. JAMES ARMOUR, C.E., under the title of "Power in Motion, horse-power, wheel-gearing, driving-bands, and angular forces," is intended especially for practical men engaged in engineering works that require the employment of horses, hoists, block and tackle, wheel-gearing, and long and short driving bands of wire-rope or of leather, and for practical men scarcely any book

could be better suited. The familiar language in which the principles are explained, and the familiar examples given in illustration of them, cannot fail to recommend it. Commencing with the consideration of horse-power, Mr. Armour continues the elucidation of his subject by explaining the effect of speed, inertia, uniform motion, force of gravity, discharging force, the laws relating to the motion of bodies on inclined planes, axle-friction, hand-power, axle-pressure, resultant forces, &c., supplying in each of the twenty-five sections into which the book is divided as much information relating to the subject treated of as practical men generally would care to possess. It is evident that no pains have been spared to render the work acceptable to those for whom it is intended, and the author seems to have attained his object completely. The book will prove of great utility to artizans in whatever branch of industry they may be engaged.

THE WHITEHAVEN IRON MINES.

The consumption of hematite iron ore has for some time past been constantly and steadily increasing, and as it is now readily saleable at from 16s. to 20s. per ton, the large margin for profit naturally offers great encouragement for commercial enterprise in this direction. The WHITEHAVEN IRON MINES (Limited) has been registered as a company, with a capital of 95,000*l.*, in shares of 10*l.*, to acquire and develope two extensive hematite iron ore royalties, upwards of 6000 acres in extent, and containing rich red kidney and Whitehaven iron ores, yielding, according to analysis, 65 per cent. of metallic iron. The quality of the ores of the Whitehaven district is well known, and the fact of the quantity annually raised having increased from 225,229 tons in 1854, to considerably over 1,000,000 tons at the present time, is a sufficient evidence of the demand that exists for them. The mineral which the present company proposes to work is situated in the mountain vein formation, so that no steam-power nor expensive machinery to open out the veins and extract the ore will be required. The Eskdale and Mitredale Mines are situated about seven miles from the port of Ravenglass, and cover an area of about 3000 acres, being held at the nominal dead rent of 20*l.* per annum, and a royalty of 7d. per ton upon all iron ore raised. The other property is of similar extent, and known as the Floutern Tarn, Starling Dodd, and Red Pike, is situated on the northern slope of the mountains, and about midway between Ennerdale and Buttermere Lakes, and is held at a nominal dead rent of 50*l.* per annum, and a royalty of 1s. per ton upon all iron ore raised.

The estimated aggregate working cost being but 9s. 6d. per ton, and the selling price 16s. to 18s., the margin for profit would be considered satisfactory to most capitalists, and the directors of the present company propose further to increase this by constructing a tramway from a point near the mines (communicating with the self-acting incline planes) to a station on the Whitehaven and Egremont Railway, which will reduce the cost of carriage about 4s. per ton. It is anticipated that the requisite works can be carried out when 200,000 tons can be put f.o.b. at Ravenglass at a profit of 12s. per ton, giving a profit of 120,000*l.* per annum, or sufficient to pay dividends at the rate of 120 per cent. A tender has been received for the construction of a tramway, which is 3¼ miles long, for 4375*l.*, so that the entrenchment upon the company's working capital will be unimportant. Indeed, it is considered probable that the line will be commenced by other parties at an early date, in which case the directors will be relieved of all trouble in the matter. The property is in the district of the celebrated Knockmurton mines, and of the Cleator Moor, Frizington, and Egremont mines, from which fabulous profits have been obtained during the last 10 years, whilst an engineer who has examined the range states that for quantity and the ease with which it can be dug from the several deposits the range has no parallel in either Cumberland or Lancashire.

The value of the company's property is very highly spoken of by Capt. W. H. Hosking and by Messrs. Moon and Barnes, who supply ample details, geological and commercial, for the guidance of intending investors. The hematite ores are chiefly found in irregular masses in the mountain limestone, and in veins in the primitive rocks; and in the present company's property the ore appears to occur in veins. The Eskdale property is well situated for extensive working, being a very precipitous mountain range, about 1000 ft. high, bounded by a dale on each side. The veins of iron ore entering the mountain at right angles, passing through its centre to the valley on the other side, thus admitting of the easy extraction of the ore by means of adit levels, open galleries, and surface quarrying, and rendering unnecessary the usual expensive hauling and pumping machinery. The two veins already laid open are the "Ban Garth" vein, near the western boundary, which in an open quarry is reported to be 20 ft. wide, of rich red hematite; and the "Nab Gill' vein, near the eastern boundary, as laid open at the top of the mountain, is reported to be 15 ft. wide, of the richest description of the red kidney ore.

The Floutern Tarn, Starling Dodd, and Red Pike property possesses great natural advantages for working on an extensive scale by means of adit levels, being nearly 2000 feet high to the summit of the mountains; and as the iron can be traced cropping out at surface these levels may be driven on the course of the veins, during the progress of which returns of ore can be made. The bearing of the veins of ore in this property is north and south, and at Floutern mineral agents who have examined the vein laid open there report it to be of massive proportions, and admitting of a large force being employed. In addition to this there are other veins reported to be as yet only partially laid open at Starling Dodd, the Waterfalls, and Red Pike, the latter mountain having, it is stated, derived its name from the veins of red hematite which it contains. The property being situated in a district of considerable geological attractions, it may be hoped that many interested may avail of the forthcoming vacation to ascertain for themselves the facilities for commercial operations which the deposits possess. The Earl of Devon is the Chairman.

COLLIERY INSURANCE.

For some time past the question of establishing a system of insurance especially applicable to collieries has been discussed in the columns of the Journal, the desirability of providing for the sufferers by colliery accidents, or, in case of fatal accidents their representatives, being admitted alike by those immediately connected with collieries and by the public. But the great question has been how to carry out the project, existing companies being unwilling to undertake the risk, and opinions being divided as to the best mode of securing the premiums. These little difficulties, however, have now been removed by the promotion of a COLLIERY INSURANCE COMPANY, with a capital of 1,000,000*l.*, in shares of 10*l.* each, for the purpose of insuring owners or lessees of collieries against loss in collieries from explosion and fire; insuring individual interests when the colliery, as a whole, is not insured; and insuring provision for widows, children, and dependent relatives of colliers killed by accidents in collieries, and as the business will be conducted by an influential board of directors, whilst Dr. Farr has charge of the actuarial department, it may reasonably be anticipated that the company's affairs will be conducted with ability and success. Of the capital to be raised 1*l.* per share is payable on application, 2*l.* on allotment, and 2*l.* four months after allotment, making 5*l.* in all, beyond which no further call is contemplated, so that there will be an uncalled capital of 500,000*l.* to form a guarantee, which will be quite ample, to those assuring with the company.

A glance at the statistics connected with the colliery interests of the kingdom, for the accuracy of which we have the guarantee of the Government Inspectors of Coal Mines, must suffice to show how large a field the company have for operation. Taking the figures in the last published official return, it is shown that in England and Scotland there are employed in mines 345,446 persons, and 1116 persons were killed by accidents during the same period. Added to this, it may be mentioned that one of the Government Inspectors has observed that there are about five non-fatal accidents for each fatal one. Taking the computation of each Inspector for his own district, the quantity of coal raised in the year was 108,003,482 tons. The explosions in collieries occur at the rate of about one each week, and, taking the average, each explosion kills 5 men and injures 25 others. These facts afford about all the data which the actuary would require, since in this system of insurance the age and healthfulness of the assurer does not enter into the question. In fixing the premium the tonnage would doubtless form the best basis, a percentage on the premium of 10, 20, 30 or more being added to cover hazardous and doubly hazardous risks.

It is remarked in the Colliery Insurance Company's prospectus that the apparent irregularity and uncertainty of colliery accidents, and the destructive nature of many of them as regards life, have led some persons unacquainted with the subject to consider this class of property to be beyond protection by a system of insurance; yet, as the directors very truly state, the experience of the last 20 years has demonstrated the fact that colliery insurance may be practised with as much certainty and success as attends any of the ordinary forms of marine, fire, and life insurance. To ourselves the matter appears extremely simple: the amount to be provided for payment to the insurers as a body must be ascertained, and it must then be considered how that amount can best be obtained; the necessary data for calculating this has already been given. If we allow the representative of every person killed 100*l.*, and pay those injured, though not fatally, 20*l.* upon the average, it would doubtless be considered a very handsome provision; yet to make this provision would require but a comparatively small amount. The 1116 persons killed would absorb 111,600*l.*, and the 5580 injured would absorb another 111,600*l.*—together, 223,200*l.*; and the reimbursement of the pecuniary loss to the colliery owners (even assuming three such lamentable accidents as the Hartley, the Oaks, and the Talk-'o-th'-Hill, which sacrificed some 650 lives between them, to occur in one year, which is most improbable) would certainly not require a larger amount than this, making a total to be provided for of 446,400*l.* Now, we have seen that 345,446 workmen are in a position to avail themselves of the assurance, whilst the coalowners are raising 108,003,482 tons per annum, the value of which is about 27,000,000*l.* Taking the premium of 2 per cent. upon the value of the coal raised (which is about 1d. per ton of coal), and adding 10 per cent. for the extra-hazardous risks, and charging the men a premium of only 3d. per month, we obtain in premiums a sum no less than 646,900*l.*, or sufficient to pay all the claims upon the company, and leave 200,000*l.* for dividends to the shareholders, which is equal to 20 per cent. upon the capital to be paid up. Yet in this calculation we have included the three greatest colliery calamities that have occurred, and have altogether made the estimate as adversely for the company as is at all reasonable. Of course, we do not know what basis of calculation has been adopted by the company, but the brief sketch given will suffice to show that there need be no difficulty in realising profits from the insurance of colliers and collieries.

Apart from the advantages of a directly pecuniary character to be anticipated from the introduction of the system of colliery assurance, it can scarcely be doubted that it would greatly tend to the safer working of collieries, and thus diminish the loss of life in connection with them, for really colliery assurance is more closely allied with boiler assurance than with either fire, life, or marine, and the increased safety that has resulted from the adoption of the boiler assurance system is well known. It is evident from the prospectus that the most important feature of the boiler assurance system will be adopted by the company, for it is stated that a general inspection of the collieries under insurance, for the private information of the company will be carefully maintained. The supervision thus exercised will be a reliable support to the colliery proprietor, and give that protection to the colliers which they will never, perhaps, be able by legislative enactment to obtain.

The truthfulness of this observation cannot be questioned, for it is well known that many who would suffer the existence of a cause of danger, notwithstanding the risk of legal proceedings, would quickly have it removed upon being served with notice from the company with which they are insured that it invalidated their policy of assurance. The company has certainly all the elements for success, and from the benefits which it will confer upon the colliery interest generally it will, no doubt, attain it.

THE HEAT-RESTORING GAS-FURNACE.

The importance of economising fuel in the manufacture of iron, to enable us successfully to compete with foreign countries, can scarcely be over estimated, and in connection with the production of the finished metal Gorman's heat-restoring furnace and Siemens' regenerative furnace have each proved to be of enormous value. In a paper read before the Institution of Engineers in Scotland Mr. Gorman remarked that when it is considered that a ton of iron at the welding point contains only the amount of heat which is due to about 56 lbs. of coal, and that usually 20 times this quantity is employed, it will appear that there is much room and much need for improvement in this department. The heat-restoring gas-furnace is designed to economise fuel by restoring part of the heat which escapes in ordinary furnaces, and it so happens that the arrangements necessary for this purpose are also admirably adapted for consuming the volatile gases of coal, thereby increasing economy and preventing smoke. It has been successfully applied in manufacturing iron, re-heating for plate and bar mills, puddling, welding scrap, &c. In the shipbuilder's yard —forging and working plates, long angles, bars, &c.; it is also in use for boiler-makers, bridge builders, rivet and nail makers, and for enamelling and annealing, and has been so often erected in the neighbourhood of Glasgow that only a very short description of it will be necessary. It is heated by combustible gases which may be supplied from any suitable source, but have hitherto been supplied from the ordinary coal or slack procured in the neighbourhood, and produced in apparatus attached to the furnace.

The gas used for illuminating towns, and the gases escaping from blast-furnaces, may also be used effectively and economically for supplying the requisite heat, so that it is not essentially necessary that the gas should be produced in connection with this furnace. The furnace, with its gas-producer and heat-restorer, occupies about the same space, and is arranged and worked in the same way as an ordinary heating or puddling-furnace, when applied to the same purpose; and, in addition to the usual damper, it has valves for regulating, admitting, or shutting off the air supplied for combustion as required. The gas producer occupies the same place as the grate room in ordinary furnaces, and only differs in being deeper, so as to allow, at all times, a thickness of over 2 feet of fuel on the grate bars; this provision is necessary to prevent carbonic acid gas from rising amongst the combustible gases, the presence of which, even in small quantities, prevents the combustion of the volatile gases of coal, and is in all cases deleterious, and cannot be too carefully guarded against. Although the difference between the gas-producer and the fire of the common furnace appears very little, yet it is very great, and it is most important that it should be understood and properly worked, or the furnace will not heat well or give its highest results. All that is required is to keep the bars clean, taking out clinkers only, but no coke or charred coal that can be avoided; fire often, and keep the fuel up level with the firing door or higher, at all times, and not to put much on at a time.

When the gas from the coal leaves the producer, carrying with it the heat generated there, it is supplied at the bridge with air in the proportion of about 12 times the weight of the fuel. The more heat which can be imparted to the air supplied for combustion the less coal is required to maintain a given temperature in the furnace. The question becomes then—What is the best practical method of transferring the greatest amount of heat from the highly heated waste products, leaving a furnace to the air entering a furnace for combustion? The apparatus employed for this purpose is called a heat-restorer; it is based on a very elegant instrument for transferring heat and which consists of two tubes, one placed within the other—the inlet of one tube adjoining the outlet of the other. The tubes are open at both ends. If hot water be poured in one tube and cold water in the other, the hot water will run out cold, and the cold water will leave the instrument heated very nearly to the temperature of the water which was poured in hot. The waste heat is transferred to the air for combustion by the restorer in the same manner. The restorer is a chamber placed usually underneath the ground line, into which is placed a number of fire-clay pipes open at each end. A wall runs up at each end of the pipes, dividing the chamber into three compartments, one large in the centre, and one at each end of the pipes into which they open, connecting the smaller end chambers. The flame, or waste heat from the furnace, passes downwards through the centre compartment, impinging on the outside of the tubes placed therein. The air for combustion enters the end space at the bottom, passes through the pipes to the other end, rising to a higher series of tubes, and re-crossing till it arrives at the top of the chamber; the effect being an upward current of air meeting a downward current of heated gases, with only the thickness of the fire-clay tube between them; the current of air inside preventing the destruction of the tube by the high temperature outside. The only extra about this furnace, which has no counterpart in the common furnace, is the restorer, and in practice it gives no trouble. A set of restorer tubes has been worked regularly for two years, and when taken out for repairs more than a half were fit for use again.

With a view to ascertain the relative merits of the common furnace and the Gorman furnace, several series of experiments have been made. Five piles each 470 lbs.=2350 lbs. were weighed and charged into the gas furnace; the result was a yield of 2247 lbs. of rolled iron, being a loss of 103 lbs., or 4·38 per cent. of the iron charged. At the same time the same number of piles of equal weight were charged into an ordinary furnace; the result was 2058 lbs. of rolled iron being a loss of 292 lbs., or 12½ per cent. nearly, of the iron charged so that in the gas-furnace 1 cwt. 3 qrs. 19 lbs. less iron is used to produce a ton of rolled iron than with the ordinary furnace. These results were confirmed by subsequent trials, the returns of each are within a fraction of the above statements. A more extended series of trials was made by the Mossend Iron Company to compare the waste of iron in the heat-restoring furnace, and that of the common furnace. Seven heats were charged into the common furnace, and seven exactly similar heats into the gas furnace; the result showed a saving in iron by the gas-furnace of 3 qrs. 19 lbs. per ton of iron produced, including croppings; but the saving is higher when estimate on finished iron, as of course it must be, to get a commercial result. Now, in producing 16 tons of finished iron, 20 tons of iron require to be heated, and when the loss on 20 tons charged is estimated on 16 tons finished iron in each case, the saving of the gas-furnace in the above instance is 1 cwt. 7 lbs. per ton of finished iron. The next comparative trials were made at the works of the Lancefield Forge Company. There were two gas-furnaces erected there, and from various causes they were not worked to a successful issue, and finally abandoned, to the loss of the firm, and of the inventor of the furnace. One of the furnaces did not work properly; in the other furnace five days' trial, producing welded iron from scrap, showed 1 cwt. 1 qr. 7 lbs. less waste per ton of iron when it was welded in the gas-furnace. The next trials for comparing the common and gas-furnaces were made by Messrs. Colville and Gray, Coatbridge, who weighed the materials during a week's work of the gas-furnace and two common furnaces. There was a saving in this instance, in iron, 1¼ cwt. at 5s.=6s. 3d.; and in fuel, 5s.; in all 11s. 3d. per ton of puddled iron. At this time the workmen stated that they would as soon work the gas as the common furnace. Further trials of a gas-furnace for welding scrap were made by Messrs. Gray and Wylie, Coatbridge, and they mention in their note that "the scrap used in these trials was all old scrap from a broker's yard; had we used new scrap of our own make, the waste would have been much less. It will be observed that triping coal was used in the heats; we are in the habit of using dross, but in this instance were disappointed in getting it in; we find dross does the work equally well, and takes very little more weight than shown."

Referring to the advantages of the new furnace, Mr. Gorman points out that the gas-furnace is more easily kept in repair, and that it will do a third more work, with about half the weight of dross that is required in coal with the common furnace, but the peculiar feature of the gas-furnace is the non-oxidising quality of the flame compared with that of the common furnace. When iron is welded in the flame of the common furnace, it is more or less oxidised or burned, depending on the amount of surface exposed, and when iron is thus heated its strength and tenacity are seriously impaired, and when it is overheated in the common furnace it is simply "burned," and any means by which such a contingency can be prevented or ameliorated ought to be adopted, more particularly in forgings, on the strength and tenacity of which depend human life, and it will materially add to our economical resources when the engineer can depend on the intrinsic quality of his material, and not be compelled to resort to mere bulk and weight for safety. Mr. Gorman further maintains that when iron has parted with the most of its impurities, it is then in the most critical condition for being oxidised or burned. While impurities are present they, to a certain extent, by their oxidation, save the iron; but, afterwards, each time it is heated in the common furnace it is exposed to free oxygen, and consequently loses its substance, strength, and tenacity, till at last it arrives at its normal state of an oxide or ironstone, and this is not a remote contingency, as a ton of scrap iron heated six times in the common furnace oxidises a ton of iron to cinder.

Mr. Gorman has introduced a new form of puddling-furnace, which has undergone several modifications in accommodation to circumstances. There was no difficulty in obtaining heat, but puddling is not a mere question of heat; and after many trials, the existing arrangement is believed to be adapted to all the conditions necessary in the puddling process. Many very favourable results have been obtained from trials of former modifications. The flame travels all round the furnace, and escapes at a port adjoining that where it enters the furnace; thence it passes under an oven or retort in which the coal is placed, so that the waste heat is caused to coke the coal previous to passing to the restorer, thereby producing a hotter and purer gas, and at less expense of coal. By this means the flame is also cooled a little, so that it is not so severe on the tubes as it was found to be when passing direct from the puddling chamber of the furnace. It will be observed that the tubes are placed behind the furnace in this instance. This was found necessary in order to allow the furnace to cool quicker for fettling, and to keep the puddling stance cooler. The method of returning the flame in the furnace was modified from an arrangement in which the flame was caused to circulate in vertical planes, the flame passing out of the back of the furnace. It is named the "whirl flame" furnace, from the action of the flame. It is worked with dross; a saving in fuel of 10 cwts. per ton of puddled iron, and a saving in the yield of iron of at least a ½ cwt. to the ton, have been obtained at the Clydesdale Iron Works, Holytown, where 12 puddling-furnaces are working on this plan. The method of returning the flame now adopted in the puddling-furnace has been found to heat a third more iron with 15 cwts. dross per day than was done formerly by a common furnace with 28 cwts. splint coal; the repairs are reduced by one-half. The puddling-furnace is now being rapidly developed; and there is no doubt, he thinks, as to its realising as large an economy as the heating furnace, the effect of which will reduce the price of making malleable iron about 20s. per ton.

In the discussion which followed the reading of the paper, it was elicited that Gorman's furnace is simpler in arrangement than Siemens', which is on the same principle as Stirling's regenerator. In reply to Mr. Kay, it was stated by Mr. Gorman that they preferred to use the blast where it could be got, and that there was no chance of dangerous explosion; he had seen some furnaces explode, but not after they had got into use, and only a few bricks had been displaced. He was engaged in applying the principle to smelting, and also to smiths' and founders' furnaces. The President (Mr. David Rowan) remarked that there were other competing furnaces, such as Siemens' and others, all brought forward as saving iron and coal, but this furnace seemed to have another advantage—to be able to use triping and dross instead of splint coal; he had no doubt that this system of furnace might come into use for other purposes. Mr. Gorman had patented improvements in furnaces in 1852, and shown how gas was produced and used in furnaces in 1858; before Siemens brought out his gas-furnace. He intended to put up furnaces to work with half the coal used by Siemens' furnace, but the consumption of fuel by those furnaces was kept in the background. But, taking such data as he had been able to get, the fuel was 6·6 cwt. per ton of iron heated; in his own case, it was as low as 3·4 or 3·5 cwt. The economy from Mr. Siemens' furnace should be greater than what is obtained, and he accounted for the defect partly from it requiring to be of the same shape at the inlet and the outlet, to allow of the reversing of the currents,—conditions which would cause great waste of fuel in other furnaces, and would also act in the same way against the Siemens' furnace. The low temperature at which the gases escape from the Siemens' furnace is referred to as an evidence that the heat is all used, but, as stated formerly, the heat contained in a ton of iron at the welding point amounts only to what can be obtained from about 56 pounds of carbon, and as fully 12 times that amount is used in his furnace, 11-12ths of the heat should escape. The largeness of

the structures would account for part of the loss of heat, but not sufficiently for the low temperature obtained, but the great loss of heat may be referred to another cause. It is a well-known fact that when the volatile gases from coal are heated above redness they are decomposed and their carbon deposited; now, it follows that when such gases are passed through the regenerator of Siemens' furnace the carbon will be deposited on the hot bricks, and will not reach the working chamber of the furnace, which is thus deprived of the heat from two-fifths of the most valuable part of the coal. When the currents are reversed this carbon will necessarily unite with the escaping flame to produce carbonic oxide gas, which is colourless, and lowers its temperature 60 per cent., and at the same time carries a great part of the fuel up the chimney, thus having an appearance of great economy, while there is actually great waste going on. Parties conversant with those subjects will understand this at once, but, as a practical proof, he might mention that while the hand may be held in the gases escaping from the Siemens' furnace, those from the heat-restoring furnace will melt brass, even while working to a much higher economy than he had heard recorded of the Siemens' furnace.

FOREIGN MINING AND METALLURGY.

In the Belgian coal trade the current of transactions has been tolerably regular; and, having regard to the season of the year, coal-owners now appear to be satisfied with the state of affairs. Coal for industrial purposes continues in good demand, as on all hands working operations are being carried on with extraordinary activity. At the same time the French markets have not responded to the hopes conceived respecting them. the orders which have come to hand from France being neither numerous nor important. This result is, of course, principally due to the fact that France has not yet entirely recovered from the terrible trials through which she has been passing since July, 1870. Coke has been sought after in Belgium, and considerable quantities have changed hands at high rates. The French establishments which have recommenced working operations are sending a good many orders to Belgium, and when the industrial life of France has regained all its energy it may be presumed that the present state of affairs will still further improve. Stocks of coal are considered to have been rather reduced in Belgium in June, and an advance in prices is, consequently, regarded as not improbable. The consumption of coal for industrial purposes has been very large, in consequence of the activity prevailing in the rolling-mills and glassworks of Belgium. Some contracts for coal and coke are stated to have been concluded on Dutch account at remunerative rates. The Courcelles-Nord Collieries Company will commence the payment to-day (July 15) of a dividend for 1870 at the rate of 3*l.* per share. The Val-Benoit Collieries Company has been paying this month a dividend of 1*l.* per share.

More numerous orders have been received for iron in the Champagne (France) group, both from Paris and the provinces. Rolled iron from coke-made pig is quoted at 9*l.* 8s. to 9*l.* 16s. per ton, first class, according to the works; iron from charcoal-made pig, or similar quality, has brought 10*l.* 16s. to 11*l.* per ton. The works are making as large deliveries to Paris as circumstances will permit, and the means of transport are considered to be improving. The line from Paris is now open to the works of the Haute-Marne, but the Eastern of France Railway Company cannot yet obtain a restoration to it of a large quantity of its rolling stock, which is detained in Prussia; it is easy to understand how much French industry suffers from this state of things. Merchants' bars are quoted at 11*l.* 4s. to 11*l.* 8s. per ton; and axles at 11*l.* 4s. to 11*l.* 12s. per ton. Proposals for important contracts for machine iron have been made, and prices are expected to advance in consequence. Advices from the Meurthe and the Moselle show that less animation is prevailing in those districts than in Champagne; orders are expected, however, to flow in, and meanwhile prices of iron and pig display great firmness. The iron trade has improved at Paris, and a rather important advance has been established in merchants' iron. The last transactions noted in rolled charcoal-made Champagne iron have been concluded at 9*l.* 4s. to 9*l.* 8s., and even 9*l.* 12s. per ton; for puddled charcoal-made iron 11*l.* 4s. to 11*l.* 8s. has been paid for immediate delivery.

The profit of the Barruelo coal mines, which are worked by the Spanish Crédit Mobilier, was reduced from 11,613*l.* in 1869 to 9020*l.* in 1870, in consequence of the competition on the Madrid market of English coal and coal obtained from new mines in the interior of Spain. The increased competition of English coal is the natural consequence of a reduction made in import duties. Efforts which the Crédit has been making to obtain new outlets for its coal induce hopes of the attainment of better pecuniary results under this head in 1871. The Crédit is interested in the Madrid Gasworks, but in the consumption of gas Madrid appears to be a strange place. Instead of using more as years roll on, like other European towns, it uses rather less.

There is nothing very particular to report with reference to the Belgian iron trade. Order books are well filled, and assure employment for some time to come. This remark applies to almost all descriptions of iron, rails excepted. The Ougrée Manufacturing Company has been paying this month a dividend of 1*l.* 4s. per share. The Sclessin Blast Furnaces, Ironworks, and Collieries Company has been paying this month interest at the rate of 5 per cent. per annum in respect of 1870-1. The Monceau Blast-Furnaces Company has been paying this month a second dividend for 1870 of 1*l.* per share. The Providence Forges Company has been paying this month a second dividend for 1869-70 of 4*l.* per share. The St. Leonard Company (Liege) for the Manufacture of Iron, Steel, Tools, and Machines, will pay on Aug. 1 a dividend for 1870-1 at the rate of 2*l.* per share. Contracts for rolling stock have been let by the administration of the Belgian State Railways. Forty open trucks for rails, to carry 10 tons each, were let to the Haine St. Pierre Blast Furnaces, Forges, and Ironworks Company, for 3512*l.*

At Havre, Chilian copper in bars has made 70*l.* per ton; refined ditto in ingots, 77*l.* to 80*l.* per ton; Peruvian minerals (pure standard), 71*l.* to 72*l.* per ton; United States (Baltimore), 76*l.* to 78*l.* per ton; Lake Superior, 80*l.* to 86*l.* per ton; Mexican and Plata in bars, 66*l.* to 68*l.* per ton; old yellow copper, 40*l.* to 44*l.* per ton; red ditto, 62*l.* to 66*l.* per ton; ditto bronze, 62*l.* to 66*l.* per ton. At Marseilles, Toka for consumption has no quotation; Spanish has brought 70*l.* per ton; refined Chilian and Peruvian, 74*l.*; and rolled red copper, in sheets, 80*l.* per ton. Banca tin has brought 79½ fls., and Billiton 78½ fls., at Rotterdam. At Amsterdam, Banca has made 79½ fls., and Billiton 78½ fls. Lead has presented little change. At Marseilles lead in saumons, first fusion, has brought 17*l.* 16s.; ditto, second fusion, 17*l.* 6s.; ditto, argentiferous, 17*l.* 12s.; lead in sheets, 20*l.* 8s.; and rolled and in pipes, 20*l.* per ton. At Marseilles zinc in plates, recast, has realised 19*l.* 4s. per ton, and rolled ditto 28*l.* per ton, with a discount of 3 per cent.

U. S. GOLD NEWS.—The Exchequer Mine is progressing satisfactorily. A few days since a vein of gold quartz was struck in the east drift of the main tunnel, 200 ft. north of the winze. The vein is 8 in. wide, and two lots assayed 2547 and 2057 respectively, in gold and silver per ton. Manager Chalmers is cross-cutting the ledge to get to the hanging-wall; has run 27 feet and is not through it; thus far it is 53 ft. wide, 6 ft. of it being in the tunnel.—The Zambranna Mine, at Mosquito Gulch, continues to yield enormously. The last crushing—50 tons—produced 459 ozs. of retorted gold, worth $8032, an average yield of $160·50 per ton. The rock has been paying at nearly the same rate for some time.—The average yield of the Palomo Mine, in Lower Rich Gulch, for some time past has been $4000 per week. Last week $5000 were cleaned up. The main shaft is to be put down 200 feet deeper, and the sinking has already commenced; when completed the total depth will be 600 ft. It is also contemplated to erect an additional battery of 40 stamps, making 76 in all.—The product of the mines in Calaveras county, so far this season, fully trebles that of last year. During the week ending May 27 there were shipped from the works of the Owens' Lake Silver Lead Company at Swansea, 581 bars of bullion, weighing 51,792 lbs.—The Weske Claim, two miles above Michigan Bluff, contains 210 acres, the property of Adolph Weske. On last Saturday a clean-up of six days' work of 20 men was 261 ozs., worth $17·50 per oz., or $4582·50; this shows over $88 per day to the man, and if we deduct $360 wages for the men, at $3 per day, Mr. Weske has cleared in one week $4222·50.—Mr. C. W. Hendel, United States Deputy Surveyor, Sierra county, is surveying, for the Sierra Buttes Company, their quartz mine, preparatory for a patent.—From Ely district (Nevada), Wells, Fargo, and Co. shipped, on June 1 and 3, by way of Salt Lake, bullion amounting to $31,247·89; and on June 4 and 6, $27,364·61; also on the 8th, $15,279·77; total, $42,644·38.—The Eureka Consolidated Company's Works, in two large and two small furnaces, smelted 101½ tons of ore, yielding one-sixth bullion. The bullion is worth $350 per ton. We believe that to be a larger amount and of greater value than has been made in the same number of furnaces in America in 24 hours.—The English representative of the Pinto Silver Mining Company was at the Maryland Mine on Tuesday, and is satisfied with the purchase. The superintendent has taken possession, and will at once proceed with the work. Up to Saturday noon there were smelted in two large and two small furnaces of the Eureka Consolidated 19 tons of bullion, of the value of $350 per ton.—There were received at the Bank of California 48 bars of bullion, worth $135,090. This was principally from the Crown Point and Yellow Jacket Mines, Washoe.—Hale and Norcross Mine is producing 100 tons of ore daily. Much work is being done in the lower level, preparatory to sinking the new incline.—The Cholla-Potosi Mine is yielding 200 tons of ore per day, of the average assay value of $62.—From the Crown Point, during May, there were reduced 6516¼ tons of ore, yielding $275,647·95, or at the rate of $42·30 per ton. There are yet thousands upon thousands of tons of equally good ore in sight. Twenty-five tons of silver bars were shipped from Wells, Fargo, and Co.'s office, to Washoe, during May—664 bars, weighing 49,838 lbs., and worth $1,146,787·53.

At White Pine the tramway has been running splendidly, carrying ore from the Eberhardt and North Aurora to the International Mill, which is running steadily to its full capacity. The affairs of the Eberhardt and Aurora Company have assumed a shape to enable the thorough working of the mines. They have been running the big mill on low grade ore, but have a lot of amalgam on hand which will shortly be ready for shipment. Original Hidden Treasure has an immense amount of high-grade ore piled up ready for shipment. Governor Blasdel is getting things in shape on the Ward Beecher Consolidated. The Manhattan Mill has started on ore from this mine, and it is the intention to start the Dayton shortly. The Troy Silver Mining Company (English) will start its 20-stamp mill, and a Stetefeldt furnace of 30 tons daily capacity, on or about Aug. 1.—From Idaho Wells, Fargo, and Co. shipped this week ten bars of bullion, worth $21,536·56, making an aggregate of $62,155·88 shipped during the month of May.—*Scientific Press* (San Francisco).

AUSTRALIA.—The production of Bismuth is steadily increasing. The smelting-house at Balhannah Mine is situated about a couple of hundred yards from the engine-shaft on the side of the isolated hill where the bismuth is found. In place of erecting a lofty chimney stack, the less expensive and equally effective plan has been adopted of carrying the pipes underground to the summit of the hill, and there constructing a flue a few feet in height. The furnaces, which are boiler-shaped, are fed with coke and charcoal, and have sufficient capacity for a hundred-pound crucible. Those now in use are only half size, and the ordinary charge is 30 lbs. of ore. The flux used is carbonate of soda, and the process from first to last is exceedingly simple. As soon as the furnaces have been prepared the crucibles containing the ore are placed in them, and they are covered with close-fitting iron slabs to prevent the bismuth, which when molten is exceedingly volatile, from evaporating. As soon as the ore is reduced to a liquid state it is poured into a mould, and allowed to cool. In this process of cooling the bismuth, in a perfectly pure state, sinks to the bottom, and becomes separated from the grosser metals. The copper, slightly impregnated with bismuth, but having comparatively little other foreign matter mixed with it, is put aside ready for shipment, and the refuse slag, after being separated by a stroke of the hammer from any bismuth that may be adhering to it, is thrown aside. With the rough and ready contrivances now in use the crucibles have to be lifted out by means of tongs, but it is intended without delay not only to increase the number of furnaces but also the conveniences for working them. The smelting branch of the business is superintended by Mr. Ey, who in a few days produced some 90 lbs. of bismuth in cakes. It is estimated that when the works are in a thoroughly efficient condition as much as from 800 to 1000 lbs. of metal will be run out from ore dressed up to 18 or 20 per cent., the ordinary average now reached. Bismuth, it is well known, is for some purposes a peculiarly useful metal, and that the supply cannot be large is attested by the fact that it is quoted in England at 17s. 6d. a pound. The company have obtained 11s. a pound for a quantity sent to Melbourne, and a good demand for more at that rate exists. It is a noteworthy fact that whilst the ore raised in the celebrated Saxon Mines only yields some 3 per cent. of bismuth, much of that obtained at Balhannah runs as high as 6 or 7 per cent. before being dressed.

GOLD.—A few days ago a payable gold field was declared to have been found, the locality being on Crystal Hill, situated within a mile and a half of the Wheatsheaf Inn, near Echunga, and on the old road from that hotel to Hahndorf. Not far from this discovery, in Donkey Gully, a pound weight of gold to the load was taken out some time ago, but when the water failed last season people who had been getting an average of 1½ dwts. to 2 dwts. each per day were forced to leave. We have been shown by Mr. S. Simons, a resident in Almanda, a small piece of quartz, thickly studded with gold, which he found about a mile and a half from the Almanda Mine. At the meeting of the company a report from Mr. W. B. Neales, who is now working the mine on tribute, stated that he cleared up on April 22, the yield being 3 ozs. 13 dwts. 22 grs. from 60 tons. He commenced a second crushing, and cleared up again on May 6, after passing 92 tons through the mill; this yielded 7 ozs. 18 dwts. 9 grs., or an average of 1 dwt. 17 grs. per ton. He was now proceeding with the third crushing, and as the second was a little better than the first hoped that the work might not stop. His opinion was that if the company would put down a shaft —say, 150 feet, or 200 feet deep to the west of the present working—they would meet with success. From Angaston the correspondent of the *Kapunda Herald* writes:—"We were agreeably surprised by the return of Mutton's party from the Uloolo diggings. They were surrounded in a very short time by numbers of enquirers as to their success. It appears they had close on an ounce of gold to be divided betwixt three, the largest piece being about the size of a bean. This has given a regular start to some to go and try their luck, though to do so they will have to leave comfortable employment for the winter." We have been informed lately, the *Gawler Times* says, that a party working on the Deep Lead had been very successful for some little time past. Their crushing last week consisted of 25 tons of cement, which yielded 17 ozs. of pure gold. We understand that other crushings are booked at the Victoria Crusher for next week. The improvements made in the Victoria Company's crusher at the Barossa diggings have proved very successful, and more gold is saved than was the case before the alteration.

COPPER.—The discovery of the Doora Mine last year, and the finding of a new lode on the Wallaroo Mine property, which promises to be equal to anything yet seen on the Peninsula, would seem rather to confirm the accuracy of the statement we have frequently ventured, that mining in this district is yet but in its infancy, than to corroborate the worked-out theory. This discovery of the new lode at the Wallaroo Mines is sufficient to make even practical men become speculative. Where it was first cut is within but a short distance of the mines' offices, and contiguous to the railway, and within but a few yards of one of the main shafts of the mine. If, then, the ground has been so partially prospected in the immediate vicinity of the mine that magnificent deposits of green ore have been undisturbed there within but a few feet of the surface, who would be bold enough to assert that there are not half-a-dozen more Wallaroo and Moonta mines in the district? Look, again, at the Doora Mine. This ground was thought to be thoroughly prospected years ago. It has passed through several hands, and now we see that it would be scarcely possible to put down a shaft within a square area of ground forming the Doora Mine without coming upon payable ore in large quantities From the great mines on the Peninsula the reports to hand speak of well maintained yields. At the Blinman in sinking the engine-shaft fresh discoveries have been made, and the mine generally is described by the workers as never having looked better than now.

BURRA MACHINERY.—To show the wonderful advantages of using efficient machinery in performing heavy work, a better illustration could, perhaps, scarcely be given than by stating that at the Burra Mine, with the assistance of a "fire whim," in one day last week 22 men broke, filled, and emptied 430 trucks of dirt, containing 1¼ ton each, these having been hauled a distance of (say) six chains, and elevated to a height of 130 ft. Under ordinary circumstances this number of men could scarcely have shovelled so much stuff into carts. Then others would have been required to drive, more to break the dirt, and a troop of horses to drag and elevate it that distance and height. The operation is very interesting, and everything seems well adapted to the work needed, and to be exactly in its place. The only defect, if such it can be called, is that the engine could do far more work if there were only more room for the labourers to break the stuff. The new dressing-machine appears to act very satisfactorily, and has brought "skimpings," or useless castaway ore, up to 35 per cent.—From the *South Australian Register*.

AUSTRALIAN MINES.

YUDANAMUTANA (Copper).—The superintendent, under date of May 20, states—"I regret to have to inform you that, by some unaccountable means, the Blinman mail bag, which should have been delivered at the post-office at Blinman, to the guard, on Monday morning last, was, much to his surprise, found missing when the bags were sorted at Kanyaka, on the road down; the result is that I am without the monthly report from Capt. Terrell for you, and am also unable to furnish you with the usual financial statement, but in the absence of which may add that the returns of the mine, so far as we can judge, have during the month of April paid the mine cost proper." I send you extracts from the captain's letters, under date, as follows:—"Blinman, April 30: I am pleased to inform you that we have cut a very nice lode of ore in the end we are driving to cut the shaft, and also a nice lode in the shaft. I think they are one and the same. I shall begin to put a bottom and block in No. 1 next week, so that we shall get two furnaces at work."—"Blinman, May 7: We have holed to the engine-shaft in the 35 fathom level, to an inch of where I wanted to. The shaft is going down exact. The last 2 fathoms we drove was through a fine branch of ore, as mentioned in my last; what lode this is I do not know, but think it is one of the caunters that went north from the No. 1 winze. I have put the No. 1 furnace to work, and if I had wood I could keep three furnaces going now. The mine is looking better now than it has for the last 12 months."

PORT PHILLIP AND COLONIAL (Gold).—The quantity of quartz crushed during the four weeks ended April 26 was 5360 tons. Pyrites treated, 134 tons; total gold obtained 1394 ozs., or an average per ton of 5 dwts. 4¾ grs. The receipts were 5230*l.*; payments, ordinary, 3336*l.*; timber and firewood account, 1120*l.*; total, 4456*l.* Profit, 774*l.*, which, added to last month's balance of 820*l.*, made an available balance of 1594*l.* The amount divided between the two companies was 1000*l.*, the Port Phillip Company's proportion of which is 650*l.* The balance of 594*l.* was carried forward. The return for the two weeks ended May 10 is—Quartz crushed, 2629 tons; pyrites treated, about 40 tons; total gold obtained, 768 ozs., or an average per ton of 5 dwts. 20 grs.: remittance, 600*l.* The company have also a telegram, dated Galle, July 9, in anticipation of the mail leaving Melbourne on June 18, and due here on August 5:—Month ended May 24, yield per ton 5 dwts. 12 grs. Two weeks ended June 7, yield per ton 6 dwts. 4 grs. Remittance, 700*l.*

ENGLISH AND AUSTRALIAN (Copper).—The quantity of coal at Port Adelaide was about 1982 tons. There were six furnaces at work at the Port Works, four roasting, and two smelting—both refineries were out. Since date of last advices no further shipments of copper had been made, but there were about 190 tons ready for shipment.

AUSTRALIAN UNITED (Gold).—Mr. Kitto, Fryerstown, May 20: The last crushings from the Duke of Cornwall Mine yielded very badly—about 1 dwt. and a few grains to the ton! There is nothing unusual in this. The lodes of this country, as of others, are broken and unsettled near the surface, and late explorations in the deep ground at Sandhurst (late Bendigo) show that lodes become defined and rich at depths varying from 300 to 700 ft. and over. The heavy water at the Central has been too much for the tributers, who are all poor men, and cannot wait the results of the drainage of the gutter. They have given up their tribute, stating as a reason that the time was too short and the tribute too high, but offering to take the mine for three years at 12 per cent. Of course only 6 per cent. would be available for the company, 6 per cent. having to go to the landlord. I have refused the tributers' offer, and sent Capt. Lean to Ballarat to organise a tribute party on terms dictated by myself, particulars of which I will send you when the matter is negociated. Taking a general review of the position of the company, it seems to me that I under estimated the cost of opening the mines at the beginning. This was done possibly because money was hard to be got in England at the time I was there. Whatever may have been the motive that actuated me when in London, the one fact is clear and distinguishable—the mines are most valuable. Fortunes are being made at our doors, and we possess over a quarter of a mile of the (second) best line of reef yet discovered in Victoria.

YORKE PENINSULA.—The directors have advices from the Committee of Inspection at Adelaide, dated May 17, with reports from the Kurilla Mine to the 19th of that month. Capt. Anthony reports that in the 25 fathom level, west of Deeble's shaft, signs of improvement are now visible; the bottom is yielding stones of rich coated ore. The 15 west is temporarily suspended, until the result of driving the 25 a few fathoms further west be ascertained. Also, that Hall's shaft is drained to the bottom (45 fms.), and the 45 fm. level east is driving by six men, at 12*l.* per fathom; the lode is 7 ft. wide, composed of quartz and clay-slate, with a little yellow ore. All well, we shall reach the line of ore-bearing ground during the present month. The 35 fathom level east is yielding 6 tons of 15 per cent. ore per fathom. We began to drive on the 16th, at 8*l.* per fathom, and allowing the men 2s. 6d. in 1*l.* for any ore they might now find; it is now worth 40*l.* per fathom, and is much easier for driving. It is a matter of great anxiety whether it will hold good going east; the size and quality are all we could desire for the depth. This run of ore ground is not reached in either the 25 or 15 fm. levels. I have, I believe, before called your attention to the copper water flowing from the lode in the ends of those levels, showing that the lode contains copper further east. I will keep you informed of the progress made, and the appearances of this important point, and hope soon to advise the driving of the 25 fathom level east from Hall's. The engine and pitwork are in fair working order.

SCOTTISH AUSTRALIAN.—The directors have advices from Mr. Morehead, the general superintendent of the company, dated Sydney, May 17. The sales of coal from the Lambton Colliery for the month of April amounted to 14,914 tons. Matters generally at the colliery had gone on during the month satisfactorily. There was still rather a scarcity of shipping for the trade.

ANGLO-AUSTRALIAN (Gold).—Mr. Kitto, Fryerstown, May 20: I am making arrangements to work both the eastern and western shafts simultaneously, and hope to have everything ready by the time next mail arrives.

FOREIGN MINES.

SIERRA BUTTES (Gold).—The secretary has received the following by cable from the agents of the company in San Francisco:—Clean up for June, $40,267; expenses, $17,311.

SOUTH AURORA.—The following satisfactory news respecting this mine is extracted from the *White Pine Daily News* of June 17: We struck a new body of ore in the south-east drift of the big cut, the extent of which is unknown. The drift is now 15 feet into the ore, and no signs of failing. Commenced a new tunnel, which will strike 60 feet below the lowest level of the mine. About 800 tons of ore on the dumps, and shipping daily 35 tons to the Stanford mill. Working 90 men.

UTAH.—The directors have received a cable message stating that the titles to the property are all in order. The written reports from Messrs. Nancarrow and Sewell have also come to hand, and fully confirm the vendor's statements as to the value of the mines, and the profits now being realised from the working of one furnace. The capital (100,000*l.*) has been paid up.

EBERHARDT AND AURORA.—The directors have received 17 bars of silver, per the Wisconsin, valued at 4100*l.*

NORTH AMERICA (Gold).—Telegram from Dr. Henry Degroot, who was selected to examine the property:—"Morgan's report substantially correct. Property unexceptionable. Past yield certain $392,000; prospective yield, $650,000 annually. Net profit half yield will continue 30 years. Labour now $3 per day."

ALMADA AND TIRITO (Silver).—Mr. Clemes (May 27) reports that the 30 stamps are at work crushing from 26 to 28 tons per diem. A bill of lading has also been received of 7 tons 250 lbs. of Petanque metal, shipped by the Colorado steamer, en route for Southampton, which is in addition to the 21 tons of Petanque shipped by the barque Evelyn Wood, worth in all about 4500*l.*

BATTLE MOUNTAIN.—Capt. Richards reports, June 22: Virgin: We are driving the 113 north. We have commenced a winze (Bishop's) in the bottom of the 113, north of shaft, which will be sunk on the course of the lode; this is instead of sinking the shaft, which for the present is suspended. The lode in the winze contains a very small quantity of black oxide of copper, but is surrounded by hard ground; as soon as we get a change of ground I think the lode will improve. In the 73, north of Hallow's shaft, the lode is about 2ft. wide, composed of killas, green carbonate, and red oxide of copper—a very promising lode. The lode in Jack's stope, in the back of the 73 feet level north, is a good orey lode. In the 73 feet level, north of shaft, the lode is of large size, and producing occasional good stones of green carbonate, red copper, and black oxide; the ground also is of a most favourable character.—Lake Superior: Pryce's shaft is nearly deep enough for a level, which in perpendicular depth will be equal to the 113 at Virgin; the portion of the lode carried contains a little ore of a promising character. Ore raised during the week, 220 sacks.

EXCHEQUER (Gold and Silver).—June 19: Bulliona: The rise in the south drift from the 140 ft. level is now up 12 ft., and the rock looking as if we were nearing the ore schutes above. Good-looking quartz, with ruby ore, is making its appearance in Starr's drift in main tunnel. Anxious to know positively what this quartz will give in bulk (I guessed it at $40), and to provide for the reduction of the ore I am taking from the south stope, I am overhauling the mill. I told you the batteries leaked, and that the cam shaft and cam pulley stood in need of repair. Believing the leakage to arise from the sinking of the foundation timbers, I had the earth removed, and found the whole cross-ties rotten. I shall have them all out and replaced, and the stamps running by Wednesday or Friday of next week, when I will crush 10 tons of different kinds, and see what they are likely to work.

CAPE (Copper).—Returns for April: From Ookiep, 570 tons; Spectakel, 100 tons; smelting works, 90 tons of regulus; transport to Port Nolloth, 615 tons of ore, and 78 tons of regulus; to Hondeklip, 54 tons of ore. Mr. Wild had arrived at the mines, and reports favourably of them, of the prospects of transport, and of the stability of the railway line.

[For remainder of Foreign Mines see to-day's Journal.]

SOUTH AFRICA.—A gold field of great richness has been found near the Tatin. About 4 tons of quartz yielded 3 lbs of gold. The diamond field newspapers, as well as the correspondents there of the colonial press, agree in saying that the finds were increasing daily in number and size. It was certain that the published lists of finds form but a portion of the gems discovered.

COPPER ORES.

Sampled June 21, and sold at Tabb's Hotel, Redruth, July 6.

Mines.	Tons.	Price.	Mines.	Tons.	Price.
Mellanear	118	£1 8 0	West Basset	30	£7 14 0
ditto	90	4 12 0	Poldice	60	2 4 0
ditto	71	1 7 6	ditto	40	6 2 0
ditto	46	3 12 6	South Crofty	34	1 19 0
ditto	24	10 19 0	ditto	32	2 2 0
West Seton	71	2 12 0	ditto	25	1 12 0
ditto	63	2 12 0	South Frances	31	4 14 0
ditto	62	6 12 6	ditto	30	3 17 0
ditto	53	8 5 6	ditto	16	5 10 0
ditto	47	7 7 0	Carn Camborne	46	3 13 0
ditto	37	4 19 6	ditto	15	1 10 0
East Pool	96	3 1 6	Wheal Prosper	40	2 11 0
ditto	82	3 1 6	ditto	18	3 3 0
ditto	45	2 13 0	Wheal Jewell	22	1 18 0
ditto	34	2 19 6	ditto	11	6 0 0
ditto	29	3 1 6	ditto	10	5 12 0
Carn Brea	66	8 3 6	West Damsel	42	2 19 0
ditto	63	3 10 0	Levant	22	3 14 0
ditto	47	3 9 6	West Frances	20	3 16 0
ditto	42	4 1 6	Dolcoath	19	4 12 0
ditto	30	3 15 6	West Gorland	15	2 11 0
ditto	27	3 17 0	Wheal Buller	12	7 10 0
West Basset	58	2 19 6	South Dolcoath	10	2 6 0
ditto	34	2 8 0	Glanville's Ore	7	2 15 0
ditto	33	3 1 6			

TOTAL PRODUCE.

Mellanear	349	£1106 7 6	Wheal Jewell	43	£ 164 16 0
West Seton	333	1727 5 0	West Damsel	42	123 18 0
East Pool	286	856 18 6	Levant	22	81 19 0
Carn Brea	275	1511 14 6	West Frances	20	76 0 0
West Basset	155	587 7 6	Dolcoath	19	87 8 0
Poldice	100	376 0 0	West Gorland	15	33 5 0
South Crofty	91	174 2 6	Wheal Buller	12	90 0 0
South Frances	77	349 19 6	South Dolcoath	10	23 5 0
Carn Camborne	61	190 15 6	Glanville's Ore	7	19 5 0
Wheal Prosper	58	158 14 0			

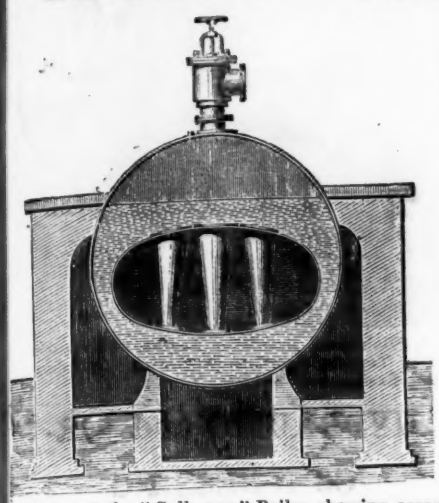
Average standard ..... £101 0 0 | Average produce 6%
Average price per ton £3 16 6
Quantity of ore ..... 1975 tons | Quantity of fine copper .. 128 tons 9 cwts.
Amount of money £7544 0 6
LAST SALE.—Average standard ..... £101 8 0—Average produce 6%
Standard of corresponding sale last month, £ 98 14 0—Produce, 6½.

COMPANIES BY WHOM THE ORES WERE PURCHASED.

Names.	Tons.	Amount.
Vivian and Sons	559½	£1378 19 6
Grenfell and Sons	297½	1438 12 6
Sims, Willyams, and Co.	218	1756 5 0
Williams, Foster, and Co.	210½	605 8 0
Mason and Elkington	280	1288 13 6
Charles Lambert	25	40 12 6
Sweetland, Tuttle, and Co.	294½	1035 15 6
Total	1975	£ 7544 0 6

NO SALE on Thursday last, June 29.
Copper ores for sale at the Royal Hotel, Truro, on Thursday next—Mines and Parcels.—Devon Great Consols 1415—South Caradon 502—Marke Valley 462—Brookwood 302—West Maria and Fortescue 201—Gunnislake (Clitters') 196—Wheal Friendship 194—East Caradon 189—West Caradon 143—Prince of Wales 62—Virtuous Lady 40.—Total, 3706 tons.

GALLOWAY'S
PATENT CONICAL WATER TUBES FOR STEAM BOILERS.



Section of the "Galloway" Boiler, showing arrangement of back flues, the furnaces being of the same construction as in the common two-flued boiler.

The above TUBES are made with such an amount of taper as will allow the bottom flange to pass through the hole in the upper side of the boiler flue, which renders their introduction into ordinary fluid boilers a simple operation, and with the following advantages :—

The POWER of the BOILER is CONSIDERABLY INCREASED, and the FLUES ARE MATERIALLY STRENGTHENED.

The CIRCULATION of the WATER is MUCH IMPROVED, and UNEQUAL EXPANSION with its attendant evils, PREVENTED.

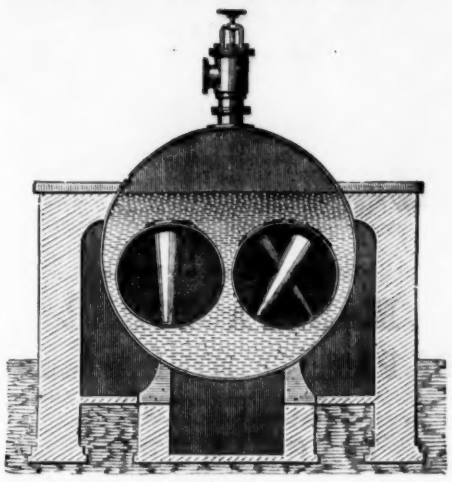
LIABILITY TO PRIME IS LESSENED.

These Tubes have now been in use upwards of fourteen years, and above 50,000 are in work in various parts of the country with the best results.

They can be fixed by any boiler-maker, but can only be obtained from the Patentees.

W. & J. GALLOWAY & SONS,
ENGINEERS AND BOILER MAKERS,
MANCHESTER,
Makers of Wrought-iron Parallel Tubes, 40s. p. cwt.

MANUFACTURERS OF THE WELL-KNOWN



Section of Cornish Boiler, showing application of the "Galloway" Tubes.

"GALLOWAY BOILER,"
AS PER SKETCH ANNEXED.

UPWARDS OF TWO THOUSAND OF WHICH ARE NOW AT WORK.

BOILERS OF ANY DIMENSIONS, UPON THIS OR ANY OTHER PLAN, CAN BE DELIVERED WITHIN A FEW DAYS FROM RECEIPT OF ORDER.

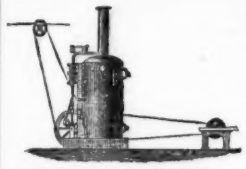
STEAM ENGINES OF EVERY DESCRIPTION.

General Millwrighting.—Hydraulic Machinery.—Polishing, Grinding, and other Machines for Plate Glass.

LEAD ROLLING MILLS AND PIPE PRESSES. CAST AND WROUGHT-IRON GIRDER BRIDGES

HALEY AND OTHER LIFTING JACKS, BOILER RIVETS, &c.—SCREW BOLTS, STEEL PUNCHING BEARS.

Shearing and Punching Machines Bending Rolls, and every description of Boilermakers' Tools, &c., &c.



STATIONARY ENGINE

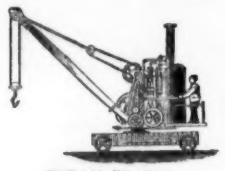
CHAPLIN'S PATENT STEAM ENGINES & BOILERS

(PRIZE MEDAL, INTERNATIONAL EXHIBITION, 1862),

The ORIGINAL combined Vertical Engines and Boilers, introduced by Mr. CHAPLIN in 1855. Each class kept in Stock for Sale or Hire.

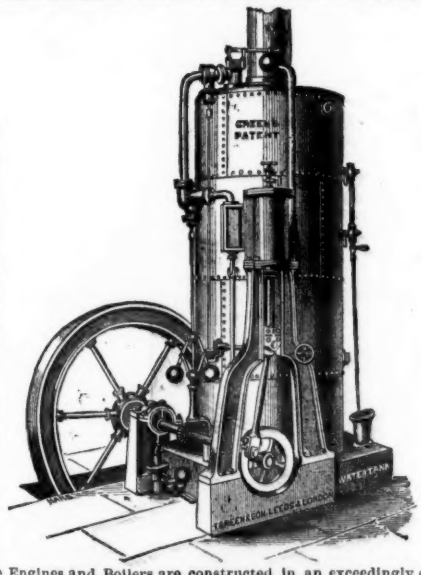
WIMSHURST & CO., ENGINEERS,

OFFICES: 117, CANNON STREET, E.C. WORKS: REGENT'S PLACE, COMMERCIAL ROAD EAST, LONDON, E.



STEAM CRANE.

GREEN'S PATENT BOILERS,
WITH INVERTED CYLINDER ENGINE COMBINED



Specially adapted for Contractors, Joiners, and Builders, Cabinet-makers, Brick-makers, Farmers, Mills, Dye-houses, Workshops, Printing-offices, &c.

For Exportation they are invaluable, being sent out in complete working order, ready for immediate use.

The above Engines and Boilers are constructed in an exceedingly substantial and simple manner, every part being easy of access, consequently can be readily understood and managed; they are fitted with governors, equilibrium throttle valve, stop valve, safety valve, feed pump, water and steam gauges complete. The foundation plate answers the purpose of feed water tank, in which the water is heated before passing into the boiler, and also of an ash-pit, and no brickwork or foundation is required.

N.B.—Upwards of 600 of these Engines and Boilers are now at work, giving entire satisfaction.

Illustrated PRICE LISTS free on application to

THOMAS GREEN AND SON,
SMITHFIELD IRONWORKS, LEEDS;
And 54 and 55, Blackfriars-road, London, S.E.

LIGHTNING CONDUCTORS

AND CHURCH CLOCKS, PRICE £10.

BAILEY and CO., Lightning Conductor and Turret Clock Makers, and Brass-founders to the British and Foreign Governments, Albion Works, Salford, Lancashire.

BAILEY'S
WINDING INDICATOR AND SIGNAL BELLS,

AS MADE BY

J. BAILEY AND CO.,

FOR THE

Collieries of the Bridgewater Trustees, Earl Bute, &c., to indicate the exact height of a cage in Mines.

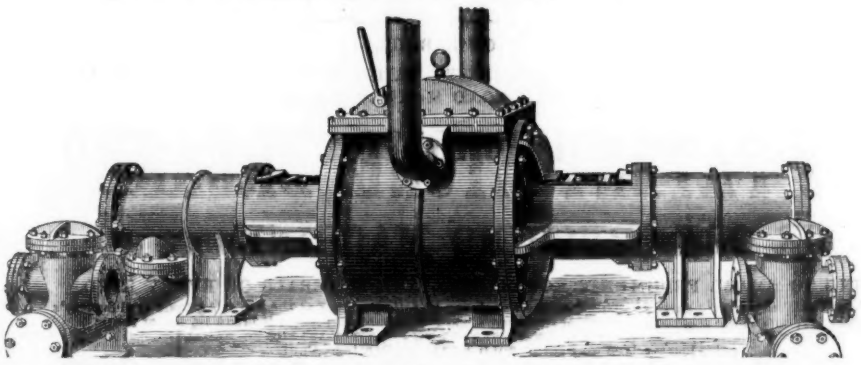
Good and strong, price £4 4s.; worm and wheel, from 10s. to 30s. extra.

BAILEY'S SIGNAL BELLS, 7 in. 35s. each.

DITTO, EXTRA STRONG, 11 in., 90s. each.

BAILEY & CO., ALBION CLOCK, BRASS & GAUGE WORKS, SALFORD.

HAYWARD TYLER AND CO.'S
PATENT STEAM PUMPING MACHINERY
FOR DEEP MINES.



The Machine erected in South Wales (at the Broad Oak Colliery, Loughor, near Llanelly), has a steam cylinder 40 inches diameter and two plungers of 8 inches diameter, and is raising 15,000 gallons of water per hour, the steam-boiler being on the surface. This it does with the greatest ease, the pump-valves working with scarcely any perceptible sound. The length of the incline besides the vertical lift is at present about 250 yards. The pump is constructed to be moved down the working as it advances, and is calculated to force the water to a height of 700 feet through a horizontal distance of 490 yards. For full description see *Mining Journal*, *Colliery Guardian*, *Engineering*, &c.

Sole Makers, HAYWARD TYLER & Co., Hydraulic Engineers,
84 and 85, UPPER WHITECROSS STREET, LONDON, E.C.

PATENT

"NE PLUS ULTRA" RESPIRATOR,

FOR

Coal Mines, Fire Brigades, Gas Companies, Breweries, Foul Wells, Chemical Works, Steam Ships, &c., &c.

This NEW RESPIRATOR is offered to the public as an INVALUABLE MEANS for SAVING LIFE and PROPERTY.

CERTIFICATE.

"*I have used it successfully at several fires, and can with confidence recommend it as one of the most useful inventions that has ever been discovered to assist firemen in the discharge of their duties.*

(Signed) *ALFRED TOZER,*
Superintendent Fire Brigade, Manchester."

PRICES:—No. 1, £8 8s.; No. 2, £9 9s.; No. 3, £10 10s. Goggles for firemen 10s. each extra. Lamps for collieries extra.

For particulars, apply to—

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F. HURD, ENGINEER,

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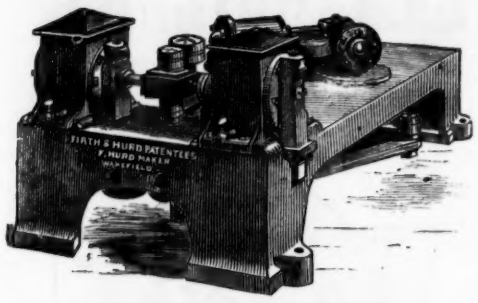
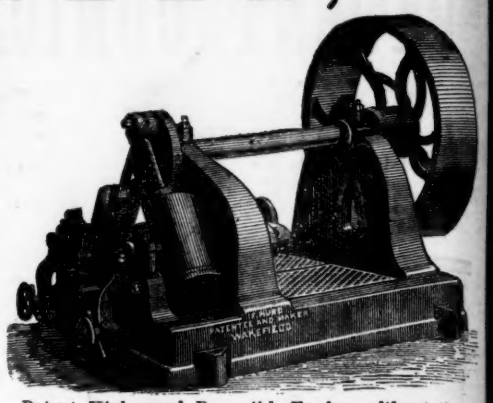
WAKEFIELD.



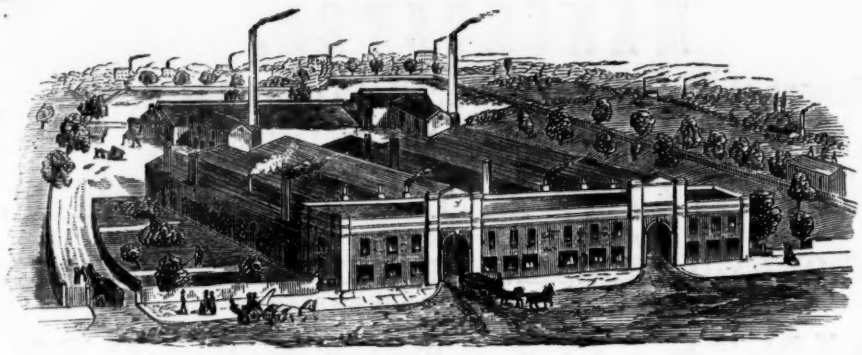
Patent Air-Compressing Engine.



Patent High-speed Reversible Engine, without the aid of Tappets, Cams, or Eccentrics. Cylinders either fixed or oscillating.

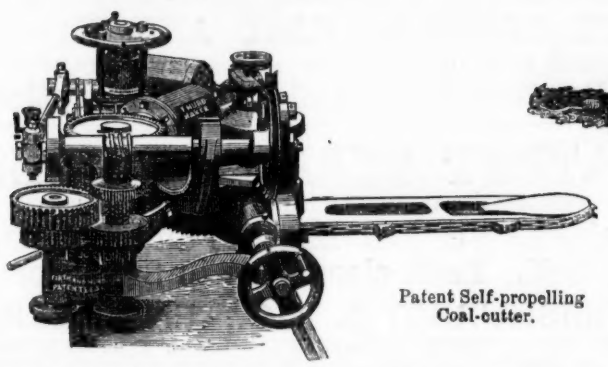
MANUFACTURER
Of PATENT MINING and EXCAVATING MACHINERY.

FIRTH'S PATENT CANNEL HUB DRESSER.

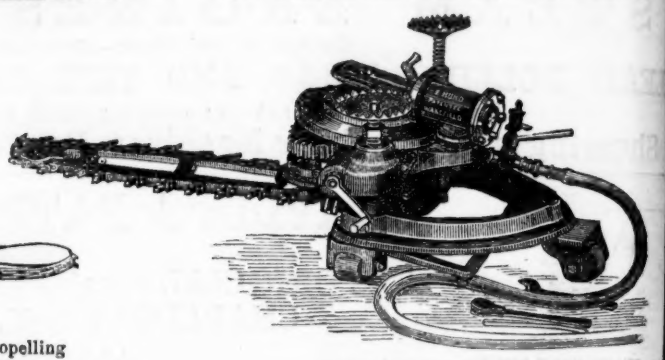


HYDRAULIC and AIR-COMPRESSING MACHINERY. Heavy, Light, and Ornamental CASTINGS, and Patent WORSTED MACHINERY.

Patent Power, or Hand Straight Work Coal-Cutting Machine.



Patent Self-propelling Coal-cutter.



Patent Power Pillar-and-Stall Work Coal-Cutting Machine.

Also, FIRTH'S PATENT ECONOMIC PERMANENT RAILWAY, without the aid of Pins, Bolts, or Wedges, that can be laid by an ordinary labourer with rapidity.

GENERAL CONTRACTOR; and Estimates given for Air-Compressing Machinery and Coal-Cutting Machinery on application.

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

IMMENSE SAVING OF LABOUR.

TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

OR ORE-CRUSHING MACHINE,

FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1¼ ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS.
It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—

The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.
For the Parys Mining Company.
H. R. Marsden, Esq. JAMES WILLIAMS.

Heton Emery Works, Manchester.—We have used Blake's patent stone breaker made by you for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.
H. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust.
Messrs. ORD and MADDISON,
Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton.
JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 181 tons of Spanish pyrites with it in seven hours.
H. R. Marsden, Esq. EDWARD AARON,
Weston, near Runcorn

For illustrated catalogue, circulars, and testimonials, apply to—

H. R. MARSDEN, SOHO FOUNDRY,

MEADOW LANE, LEEDS,

ONLY MAKER IN THE UNITED KINGDOM.

London: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH (the proprietors), at their office, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—July 15, 1871.